

1937

## Iowa State College of Agriculture and Mechanic Arts Official Publication

Iowa State University

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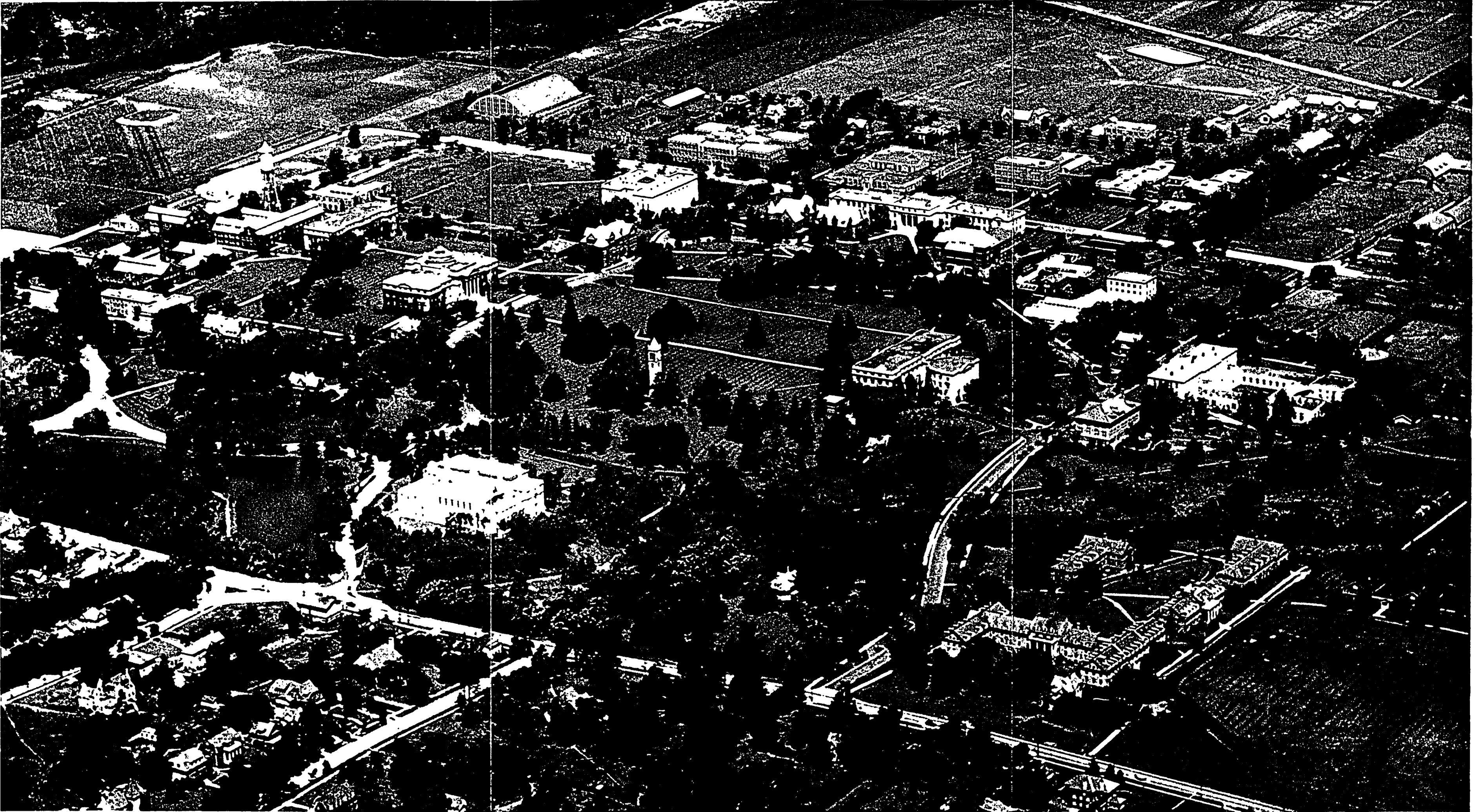
**IOWA STATE COLLEGE  
OF AGRICULTURE AND  
MECHANIC ARTS . .  
OFFICIAL PUBLICATION**



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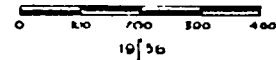
**ANNOUNCEMENTS**

**1937-1938**



IOWA STATE COLLEGE CAMPUS

CAMPUS  
IOWA STATE COLLEGE  
AMES IOWA



OAKLAND ST

WEST ST

SHELDON AVE

WEST STADIUM

STATE FIELD

EAST STADIUM

MEN'S  
DORMITORY

GYMNASIUM

BOWLING  
GREEN

WELCH AVE

TO  
DAIRY, POULTRY,  
HOG & AGRONOMY  
FARMS

STANTON AVE

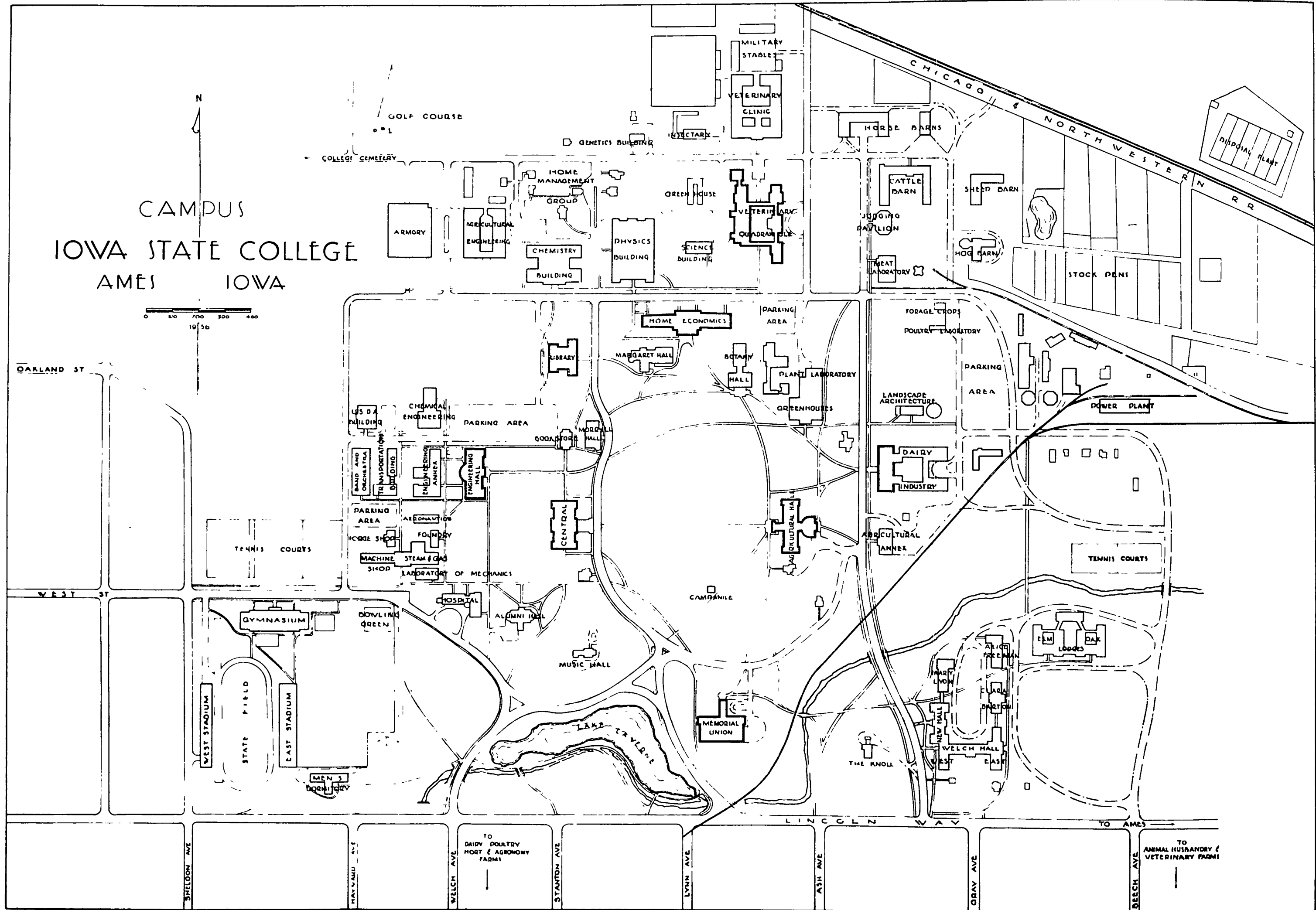
LYNN AVE

ASH AVE

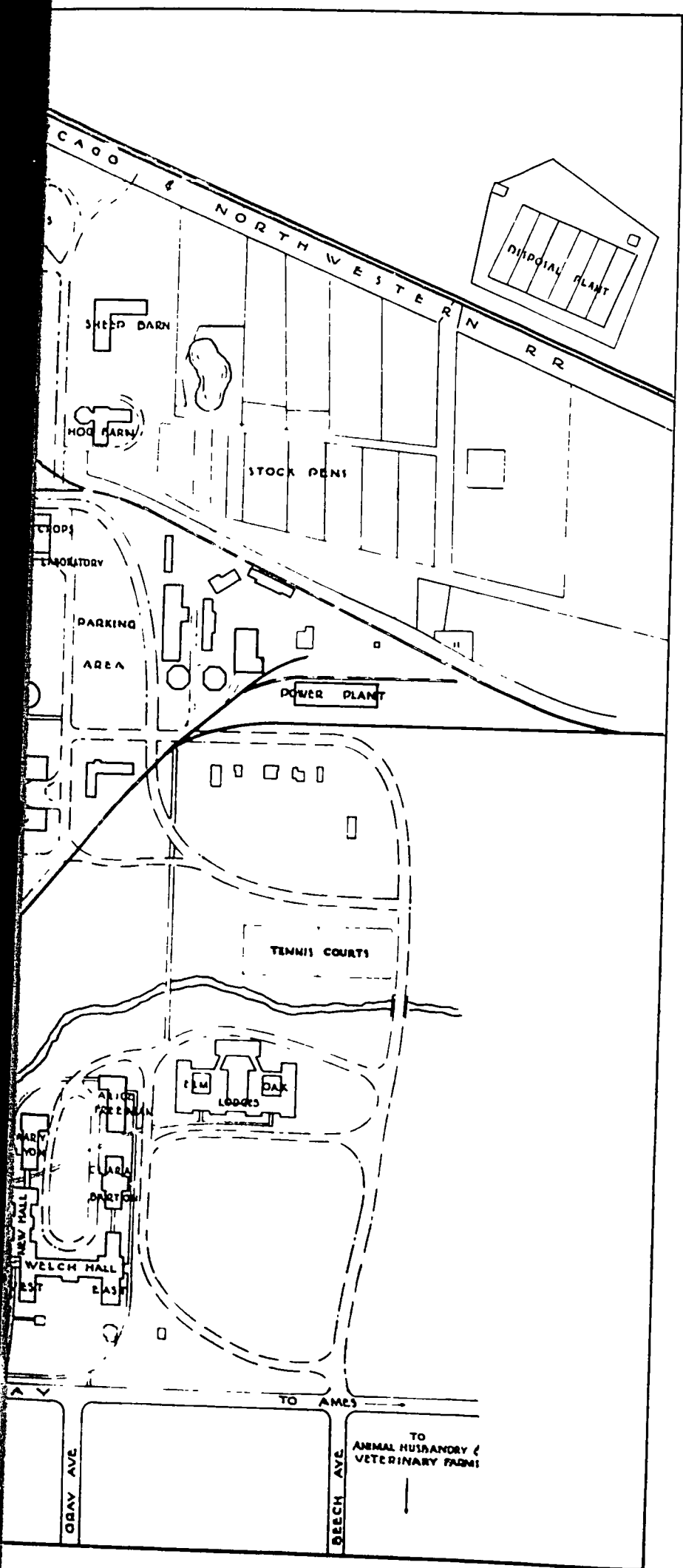
GRAY AVE

BEECH AVE

TO  
ANIMAL HUSBANDRY &  
VETERINARY FARMS







# **IOWA STATE COLLEGE OF AGRICULTURE AND . . MECHANIC ARTS . . OFFICIAL PUBLICATION**

## **CATALOGUE NUMBER ANNOUNCEMENTS 1937-1938**



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**VOLUME XXXV, NO. 41**

**MARCH 10, 1937**

**AMES, IOWA**

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## CALENDAR FOR 1937

SEPTEMBER							OCTOBER							NOVEMBER							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
			1	2	3	4						1	2		1	2	3	4	5	6				1	2	3	4
5	6	7	8	9	10	11	3	4	5	6	7	8	9	7	8	9	10	11	12	13	5	6	7	8	9	10	11
12	13	14	15	16	17	18	10	11	12	13	14	15	16	14	15	16	17	18	19	20	12	13	14	15	16	17	18
19	20	21	22	23	24	25	17	18	19	20	21	22	23	21	22	23	24	25	26	27	19	20	21	22	23	24	25
26	27	28	29	30			24	25	26	27	28	29	30	28	29	30					26	27	28	29	30	31	
							31																				

# CALENDAR FOR 1938

JANUARY							FEBRUARY							MARCH							APRIL							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
						1			1	2	3	4	5			1	2	3	4	5							1	2
2	3	4	5	6	7	8	6	7	8	9	10	11	12	6	7	8	9	10	11	12	3	4	5	6	7	8	9	
9	10	11	12	13	14	15	13	14	15	16	17	18	19	13	14	15	16	17	18	19	10	11	12	13	14	15	16	
16	17	18	19	20	21	22	20	21	22	23	24	25	26	20	21	22	23	24	25	26	17	18	19	20	21	22	23	
23	24	25	26	27	28	29	27	28						27	28	29	30	31			24	25	26	27	28	29	30	
30	31																											
MAY							JUNE							JULY							AUGUST							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
1	2	3	4	5	6	7				1	2	3	4						1	2	1	2	3	4	5	6		
8	9	10	11	12	13	14	5	6	7	8	9	10	11	3	4	5	6	7	8	9	7	8	9	10	11	12	13	
15	16	17	18	19	20	21	12	13	14	15	16	17	18	10	11	12	13	14	15	16	14	15	16	17	18	19	20	
22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	20	21	22	23	21	22	23	24	25	26	27	
29	30	31					26	27	28	29	30			24	25	26	27	28	29	30	28	29	30	31				
														31														

SEPTEMBER							OCTOBER							NOVEMBER							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
				1	2	3						1				1	2	3	4	5					1	2	3
4	5	6	7	8	9	10	2	3	4	5	6	7	8	6	7	8	9	10	11	12	4	5	6	7	8	9	10
11	12	13	14	15	16	17	9	10	11	12	13	14	15	13	14	15	16	17	18	19	11	12	13	14	15	16	17
18	19	20	21	22	23	24	16	17	18	19	20	21	22	20	21	22	23	24	25	26	18	19	20	21	22	23	24
25	26	27	28	29	30		23	24	25	26	27	28	29	27	28	29	30				25	26	27	28	29	30	31
							30	31																			



# College Calendar

## 1937-1938

The General Faculty has one regular meeting each quarter and other called meetings. The faculties of the different divisions meet each month as follows:

First Monday, 4:15 P. M. . . . .	Home Economics
Wednesday, following first Monday, 4:15 P. M. . . . .	Engineering
Thursday, following first Monday, 4:15 P. M. . . . .	Agriculture
Second Monday, 4:15 P. M. . . . .	Industrial Science

This calendar is subject to change at any time

1937

### SUMMER QUARTER

#### FIRST TERM

June 15, Tuesday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
June 16, Wednesday, 7:00 A. M.	Class Work Begins
June 16-19, Wednesday to Friday	4H Club Girls
June 21-25, Monday to Friday	Country Life Institute
July 22, Thursday, 5:00 P. M.	First Term Closes

#### SECOND TERM

July 22, Thursday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
July 23, Friday, 7:00 A. M.	Class Work Begins
August 28, Saturday, 12:00 M.	Second Term Closes

### FALL QUARTER

September 22, Wednesday, 8:30 A. M.	Opening Faculty Convocation
September 23, Thursday, 8:00 A. M. to 12:00 M.	Entrance Examinations
September 23-24, Thursday and Friday	Examinations in Back Work
September 23-27, Thursday, 1:00 P. M. to Monday, 5:00 P. M.	Freshman Days
September 27, Monday, 8:00 A. M. to 5:00 P. M.	Registration-Classification for all Except new Freshmen and Sophomores
September 28, Tuesday, 8:00 A. M.	Class Work Begins
October 7, Thursday, 11:00 A. M.	Divisional Convocations
November 4, Thursday	Mid-Quarter Reports Due
November 10, Wednesday	Final Date for Filing Diploma Slips for Fall Quarter
November 25, Thursday	Thanksgiving Day—Holiday
December 16, Thursday, 8:00 A. M.	Final Examinations Begin
December 22, Wednesday, 10:00 A. M.	Final Examinations Close
December 22, Wednesday, 10:30 A. M.	Graduation Exercises
December 22, Wednesday, 12:00 M.	Fall Quarter Closes
December 27-29, Monday to Wednesday	Boys Short Course

1938

## WINTER QUARTER

January 1, Saturday	Entrance Examinations and Examinations in Back Work
January 3, Monday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
January 4, Tuesday, 8:00 A. M.	Class Work Begins
February 3, Thursday	Mid-Quarter Reports Due
February 7-12, Monday to Saturday	Farm and Home Week
February 7, Monday	Final Date for Filing Diploma Slips for Winter Quarter
February 14 to 19, Monday to Saturday	Dairy Manufacturing Short Course
March 14, Monday, 1:00 P. M.	Final Examinations Begin
March 19, Saturday, 10:00 A. M.	Final Examinations Close
March 19, Saturday, 10:30 A. M.	Graduation Exercises
March 19, Saturday, 12:00 M.	Winter Quarter Closes

## SPRING QUARTER

March 22, Tuesday	Entrance Examinations and Examinations in Back Work
March 24, Thursday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
March 25, Friday, 8:00 A. M.	Class Work Begins
April 28, Thursday	Mid-Quarter Reports Due
May 2, Monday	Final Date for Filing Diploma Slips for Spring Quarter
May 30, Monday	Memorial Day—Holiday
June 3, Friday, 1:00 P. M.	Final Examinations for Seniors Begin
June 6, Monday, 8:00 A. M.	Final Examinations for Other Students Begin
June 8, Wednesday, 5:00 P. M.	Senior Work Closes
June 10, Friday, 5:00 P. M.	Final Examinations Close
June 10, Friday, 8:00 P. M.	Senior Promenade
June 11, Saturday	Alumni Day
June 12, Sunday, 10:30 A. M.	Baccalaureate Sermon
June 12, Sunday, 3:00 P. M.	President's Reception
June 13, Monday, 10:00 A. M.	Commencement

1938

## SUMMER QUARTER

## FIRST TERM

June 14, Tuesday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
June 15, Wednesday, 7:00 A. M.	Class Work Begins
July 21, Thursday, 5:00 P. M.	First Term Closes

## SECOND TERM

July 21, Thursday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
July 22, Friday, 7:00 A. M.	Class Work Begins
August 27, Saturday, 12:00 M.	Second Term Closes

## SPECIAL EVENTS CALENDAR

## FALL QUARTER, 1937

September 23, Thursday, 7:30 P. M.—Freshman Mixer  
September 24, Friday, 7:30 P. M.—Freshman Reception, Divisional Deans and Student Councils Hosts.  
October 1, Friday, 7:30 P. M.—Y. W. C. A. and Y. M. C. A. All-College Mixer.  
October 2, Saturday, 8:00 P. M.—President's Reception.  
October 8, Friday, 7:30 P. M.—Ward Round-Up.  
October 16, Saturday, 8:00 P. M.—Harvest Ball  
October 29, Friday, 5:30 P. M.—Cardinal Guild Barbecue.  
October 29, Friday, 9:00 P. M.—Homecoming Pep Dance.  
October 30, Saturday—Homecoming—University of Missouri Football Game.  
November 3, Wednesday, 6:00 P. M.—Interfraternity Pledge Dinner.  
November 6, Saturday, 8:00 P. M.—Engineers' Carnival and Dance.  
November 13, Saturday, 8:00 P. M.—Horticulture-Forestry Dance.  
November 20, Saturday—Parents' Day—Kansas State Football Game.  
November 20, Saturday, 8:00 P. M.—Home Economics Dance.  
December 4, Saturday, 8:00 P. M.—Junior Prom.  
December 5, Sunday, 4:30 P. M.—Girls' Glee Club Candle Light Service.  
December 12, Sunday, 3:30 P. M.—"The Messiah"

## WINTER QUARTER, 1938

January 8, Saturday, 8:00 P. M.—Annual Veterinary Informal.  
January 13-16, Thursday through Sunday—Annual All-College Religious Meetings.  
January 22, Saturday, 8:00 P. M.—Industrial Science Dance.  
January 29, Saturday, 8:00 P. M.—Women's Panhellenic Formal Dance.  
February 5, Saturday, 8:00 P. M.—Engineers' Ball.  
February 7-12, Monday through Saturday—Farm and Home Week.  
February 9, Wednesday, 7:15 P. M.—Little International.  
February 12, Saturday, 8:00 P. M.—Men's Panhellenic Formal Dance.  
February 19, Saturday, 6:00 P. M.—Dormitory "Valentine" Formal Dinner Dance.  
February 26, Saturday, 8:00 P. M.—Ward System Dance.  
March 5, Saturday, 6:00 P. M.—Dormitory "St. Patrick" Formal Dinner Dance.  
March 5, Saturday, 8:00 P. M.—Military Circus.

## SPRING QUARTER, 1938

April 2, Saturday, 8:00 P. M.—Annual Bomb Ball.  
April 9, Saturday—Science Day—Division of Industrial Science.  
April 9, Saturday, 8:00 P. M.—Freshman-Sophomore Ball.  
April 15, Friday, 8:15 P. M.—Good Friday Program.  
April 16, Saturday, 8:00 P. M.—Men's Glee Club Concert.  
April 17, Sunday, 7:45 P. M.—Easter Service.  
April 23, Saturday, 8:00 P. M.—Military Ball.  
April 30, Saturday, 8:00 P. M.—Varsity "I" Carnival and Dance.  
May 12, 13, 14, Thursday, 10:30 A. M. through Saturday, 11:30 P. M.—VEISHEA.  
May 17, Tuesday, 6:00 P. M.—All-Fraternity Dinner.  
May 26, Thursday, 6:00 P. M.—Honors' Day Dinner.  
June 10, Friday, 9:00 P. M.—Senior Prom.

# Iowa State Board of Education

GEO. T. BAKER, President . . . . . PRESIDENT  
M. R. PIERSON, Secretary . . . . . DES MOINES

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## MEMBERS OF BOARD

TERMS EXPIRE JULY 1, 1937

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J. H. ANDERSON . . . . . THOMPSON  
THOMAS W. KEENAN . . . . . SHENANDOAH

TERMS EXPIRE JULY 1, 1939

CORA E. SIMPSON . . . . . DECORAH  
S. J. GALVIN . . . . . SHEFFIELD  
HENRY C. SHULL . . . . . SIOUX CITY

TERMS EXPIRE JULY 1, 1941

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ANNA B. LAWTHOR . . . . . DUBUQUE  
JOHN P. WALLACE . . . . . DES MOINES

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JOHN P. WALLACE, GEO. T. BAKER.  
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WM. G. NOTH . . . . . DES MOINES  
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ANSON MARSTON, C.E., D.Engr. . . . Senior Dean of Engineering  
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ERNEST W. LINDSTROM, Ph.D. . . . Vice Dean of Graduate College

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HEIN, V. L., B.S., . . . . . Office Manager  
MURRAY, C. B. . . . . Treasurer  
JOHNSON, GENEVIEVE, A.B. . . Auditor of Student Organizations

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RICE, MRS. LOLA S., B.S.	Assistant to the Dean

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STANTON, MARGARET	Director of Social Life
BARRON, WALLACE E., B.S.	Assistant Director of Personnel for Men
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FULLER, G.M., B.A., M.B.A.	Personnel Officer, Industrial Science
MURRAY, CHARLES, D.V.M.	Personnel Officer, Veterinary Medicine

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SCHANKE, ARTHUR NORMAN, M.D.	Medical Advisor for Men
ROSEBROOK, LEE R., M.D.	Medical Advisor for Men
KALAR, SARA BLAINE, M.D.	Medical Advisor for Women
GOULDING, FERN A., R.N., A.B.	Head of Health Education for Women
FORD, MARIE	Supervisor of Nurses
OHLMAN, MARGARET, Ph.D.	Dietitian
GANSCHOW, AMANDA	Chemical and Bacteriological Technician
SPRAQUE, ESTHER	X-ray and Physical Therapy Technician
MURPHY, LEWINE	Pharmacist
JOHNSON, ELIZABETH	Dental Hygienist



## LIBRARY STAFF

BROWN, CHARLES H., B.A., M.A., B.L.S., Librarian, 1922.  
DUNBAR, RALPH M., B.A., M.A., Assistant Librarian, 1924.  
WARNER, ELEANOR FRANCES, B.A., M.A., B.L.S., Serials Librarian, 1923.  
OBERHEIM, GRACE M., B.A., Loan Librarian, 1923.  
WIMERSBERGER, EVELYN G., A.B., B.S., Cataloger, 1924.  
CRAWFORD, HELEN, B.A., B.S., Classifier, 1931.  
STROHBEHN, ELIZABETH, B.A., B.S., Order Librarian, 1929.  
ORR, ROBERT WILLIAM, B.S., Reference Librarian, 1930.  
HINRICHS, FRIEDA ALBERTA, B.A., B.S., Cataloger, 1928.  
BORMANN, FLORENCE EVA, B.A., Cataloger, 1935.  
HURLBUTT, HELEN MARIE, B.A., B.S.L.S., Cataloger, 1932.  
KEMP, MURIEL LOUISE, B.S., Exchange Librarian, 1933.  
ROSENFELD, ROSE, B.S., Cataloger, 1934.  
CALLAHAN, MARY JOSEPHINE, A.B., M.A., B.S., Assistant, Reference Department, 1935.  
LEE, KATHERINE VIRGINIA, B.S.L.S., B.A., Assistant Loan Librarian, 1935.  
FORD, MRS. KATHLEEN R., B.S., M.S., Instructor, Library Courses, 1933.  
TERRELL, MRS. LEONA W., B.A., B.S.L.S., Attendant, Engineering Reading Room, 1934.  
CARPENTER, ELVA L., B.S., Assistant, Reserve Room, 1934.  
GINGER, RUTH DOROTHY, B.S., Assistant, Loan Department, 1935.  
SUOMI, EMMA, B.S., Assistant, Serials Department, 1935.  
JOHNS, BLANCHE B., A.B., Assistant, Loan Department, 1925.  
KELLY, ANNA WINIFRED, B.A., B.S.L.S., Assistant, Loan Department, 1936.

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CUNNINGHAM, JULES C., B.S., Special Bibliographer, 1934, 1911.

## CHRISTIAN ASSOCIATIONS

CUNNINGHAM, RAY C., B.S. . . . General Secretary of the Y. M. C. A.  
TEMPLETON, HAROLD P., B.S. . . Associate Secretary of the Y. M. C. A.

# Officers of Instruction\*

FRILEY, CHARLES EDWIN, President, Acting Dean of Industrial Science, 1936, 1932.

B.S., Agricultural and Mechanical College of Texas, 1919; A.M., Columbia University, 1923; LL.D., Simmons University, 1929.

## PROFESSORS AND HEADS OF DEPARTMENTS

AGG, T. R., Dean of Engineering, Director of Engineering Experiment Station, 1932, 1913.\*\*

B.S. (E.E.), Iowa State College, 1905; C.E., *ibid.*, 1914.

BAKKE, ARTHUR LAWRENCE, Professor of Plant Physiology, 1925, 1910.

B.S., Iowa State College, 1909, M.S., *ibid.*, 1911; Ph.D., University of Chicago, 1917.

BECKER, ELERY R., Professor of Protozoology, 1934, 1925.

A.B., University of Colorado, 1920; D.Sc., Johns Hopkins, 1923.

BENBROOK, EDWARD ANTONY, Professor and Head of Veterinary Pathology, 1919, 1918.

V.M.D., University of Pennsylvania, 1914.

BERGMAN, HENRY DALE, Professor and Head of Veterinary Physiology and Pharmacology, 1916, 1910.

D.V.M., Iowa State College, 1910.

BEVAN, WILLIAM ALFRED, Professor of Mechanical Engineering, 1929, 1909-1912, 1904-1905.

B.S., Iowa State College, 1904; M.S., Massachusetts Institute of Technology, 1921; B.S. (M.E.), Purdue University, 1926.

BLISS, RALPH KENNETH, Director of Agricultural and Home Economics Extension, 1914.

B.S.A., Iowa State College, 1905.

BRANDT, IVA L., Professor of Textiles and Clothing, 1920, 1912.

B.S., Iowa State College, 1905; M.S., Simmons College, 1925.

BROWN, CHARLES HARVEY, Librarian, 1922.

B.A., Wesleyan University, 1897; M.A., *ibid.*, 1899; B.L.S., New York State Library School, 1923.

BROWN, FRANK EMERSON, Professor of Chemistry, 1923, 1917.

A.B., Kansas State Normal School, 1911; S.B., University of Chicago, 1913; Ph.D., *ibid.*, 1918.

\*The General Faculty consists of the President, Deans, Business Manager, Registrar, Personnel Directors, all Professors and Associate Professors, Librarian, Director of Agricultural Extension Work, Director of Engineering Extension Work.

\*\*First date after the name indicates date of appointment to present position; the second date, when the first fails to do so, indicates the date of first appointment in the college.

- BROWN, PERCY EDGAR, Professor and Head of Agronomy, 1932, 1910.  
B.Sc., Rutgers College, 1906; A.M., *ibid.*, 1909; Ph.D., *ibid.*, 1912.
- BUCHANAN, JOHN HALL, Professor of Chemistry, 1930, 1911.  
B.S., Iowa State College, 1911; M.S., *ibid.*, 1915.
- BUCHANAN, ROBERT EARLE, Dean of Graduate College, Professor and Head of Bacteriology, Director of Agricultural Experiment Station, 1919, 1904.  
B.S., Iowa State College, 1904; M.S., *ibid.*, 1906; Ph.D., University of Chicago, 1908.
- CAINE, ALFRED B., Professor of Animal Husbandry, 1936, 1916.  
B.S., Utah Agricultural College, 1914; M.S., Iowa State College, 1917.
- CANNON, CLAWSON Y., Professor of Dairy Husbandry, 1930.  
B.S., Utah Agricultural College, 1913; M.S., Iowa State College, 1924; Ph.D., *ibid.*, 1927.
- CAUGHEY, ROBERT ANDREW, Professor of Structural Engineering, 1930, 1919.  
B.S. (C.E.), Pennsylvania State College, 1907; C.E., *ibid.*, 1916.
- CLEGHORN, MARK PERKINS, Professor and Head of Mechanical Engineering, 1936, 1902.  
B.S. (E.E.), Iowa State College, 1902; M.E., *ibid.*, 1907.
- CONVERSE, BLAIR, Professor and Head of Technical Journalism, 1927, 1919.  
A.B., Earlham College, 1914; M.A., University of Wisconsin, 1918.
- COOVER, MERVIN S., Professor and Head of Electrical Engineering, 1935.  
E.E., Rensselaer Polytechnic Institute, 1914.
- COOVER, WINFRED FORREST, Professor and Head of Chemistry, 1913, 1904.  
A.B., Otterbein College, 1900; A.M., Ohio State University, 1903; D.Sc., Otterbein College, 1935.
- COVAULT, CLARENCE HARTLEY, Professor of Veterinary Medicine, 1929, 1917.  
D.V.M., Ohio State University, 1911.
- COX, PAUL ERNEST, Professor and Head of Ceramic Engineering, 1926, 1920.  
B.S. (Cer.), Alfred University, 1905; D.Sc., *ibid.*, 1935.
- CRANOR, KATHERINE TAYLOR, Professor of Textiles and Clothing, 1921.  
B.S., Columbia University, 1914; A.M., *ibid.*, 1918; Diploma Academie de Coupe, Paris, France, 1914.
- CUNNINGHAM, JULES C., Special Bibliographer (Library), 1934, 1911.  
B.S., Kansas State College, 1905.
- CURTISS, CHARLES FRANKLIN, Senior Dean of Agriculture, 1932, 1891.  
B.S.A., Iowa State College, 1887; M.S.A., *ibid.*, 1892; D.S. in Agriculture, Michigan Agricultural College, 1907.
- DANA, FOREST CHARLES, Professor of General Engineering, 1926, 1923.  
B.S. (C.E.), University of Washington, 1914; C.E., Iowa State College, 1924.
- DAVIDSON, J. BROWNEE, Professor and Head of Agricultural Engineering, 1907, 1905.  
B.S., M.E., University of Nebraska, 1904; A.E., *ibid.*, 1914; D. Engr., *ibid.*, 1931.
- DERBY, J. RAYMOND, Professor and Head of English, 1929, 1914.  
A.B., Southwestern College, 1911; A.M., University of Kansas, 1912; Ph.D., Harvard University, 1929.

- DEVRIES, LOUIS, Professor and Head of Modern Languages, 1921, 1913.  
A.B., Central Wesleyan College, 1907; A.M., Northwestern University, 1908;  
Ph.D., *ibid.*, 1918.
- DIETZ, S. M., Professor of Plant Pathology, 1934, 1925.  
B.S., Iowa State College, 1917; M.S., *ibid.*, 1918; Ph.D., *ibid.*, 1924.
- DODDS, JOHN S., Professor of Civil Engineering, 1934, 1912.  
B.S. (C.E.), Iowa State College, 1912; C.E., *ibid.*, 1917.
- DRAKE, CARL JOHN, Professor and Head of Zoology and Entomology, 1922.  
B.Sc., B.Ped., Baldwin-Wallace College, 1912; M.A., Ohio State University,  
1914; Ph.D., *ibid.*, 1921.
- EDWARDS, JAMES FRANKLIN, Professor of Hygiene, 1921.  
A.B., Grove City College, 1894; A.M., *ibid.*, 1896; M.D., University of Penn-  
sylvania, 1898.
- ELWOOD, PHILLIP HOMER, JR., Professor and Head of Landscape Archi-  
tecture, 1923.  
B.S.A., Cornell University, 1910.
- ERWIN, A. T., Professor of Horticulture, 1913, 1902.  
B.S., University of Arkansas, 1900; M.S., Iowa State College, 1902.
- EVANS, JOHN ELLIS, Professor and Head of Psychology, 1922, 1921.  
A.B., Indiana University, 1910; M.A., *ibid.*, 1911; Ph.D., Columbia Univer-  
sity, 1916.
- FABER, DANIEL C., Director of Engineering Extension, 1918, 1914.  
B.S., University of Illinois, 1908; E.E., *ibid.*, 1911.
- FISH, FRED ALAN, Professor of Electrical Engineering, 1907, 1905.  
M.E., (E.E.), Ohio State University, 1898.
- FISHER, GENEVIEVE, Dean of Home Economics, 1927, 1914.  
B.S., Columbia University 1914; A.M., *ibid.*, 1927.
- FOX, GERALD WILLIS, Professor of Physics, 1934, 1930.  
A.B., University of Michigan, 1923, A.M., *ibid.*, 1925; Ph.D., *ibid.*, 1926.
- FOUST, HARRY LEWIS, Professor and Head of Veterinary Anatomy, 1927.  
D.V.M., Ohio State University, 1914.
- FOWLER, GEORGE R., Professor and Head of Veterinary Surgery, 1932, 1928.  
B.S., Washington State College, 1925; D.V.M., *ibid.*, 1925.
- FULLER, ALMON HOMER, Professor and Head of Civil Engineering, 1920.  
C.E., Lafayette College, 1897; M.S., *ibid.*, 1900; M.C. E., Cornell University  
1898; D.Eng., Lafayette College, 1936.
- FULLER, GEORGE MILTON, Professor of Economics, 1924, 1920.  
A.B., University of Wisconsin, 1917; M.B.A., University of Southern Cali-  
fornia, 1928.
- FULMER, ELLIS INGHAM, Professor of Chemistry, 1923, 1919.  
B.A., Nebraska Wesleyan University, 1912; M.A., University of Nebraska,  
1913; Ph.D., University of Toronto, 1919.
- GASKILL, HAROLD VINCENT, Professor of Psychology, Assistant to the Dean  
of Industrial Science, 1936, 1930.  
B.A., Ohio State University, 1926; M.A., *ibid.*, 1927; Ph.D., *ibid.*, 1930.
- GIESE, HENRY, Professor of Agricultural Engineering, 1930, 1914.  
B.S. (Arch.E.), Iowa State College, 1919; M.S. (A.E.), *ibid.*, 1927; Arch. E.,  
*ibid.*, 1930.

GILKEY, HERBERT JAMES, Professor and Head of Theoretical and Applied Mechanics, 1931.

B.S. (C.E.), Oregon State College, 1911; S.B. (C.E.), Massachusetts Institute of Technology, 1916; B.S. (C.E.), Harvard University, 1916; M.S. (T.&A.M.), University of Illinois, 1923.

GILMAN, HENRY, Professor of Chemistry, 1923, 1919.

B.S., Harvard University, 1915; M.S., *ibid.*, 1917; Ph.D., *ibid.*, 1918.

GILMAN, JOSEPH C., Professor of Botany, 1934, 1918.

B.S., University of Wisconsin, 1912; M.S., *ibid.*, 1914, Ph.D., Washington University, 1915.

GLEISER, FERN WILLARD, Professor and Head of Institution Management, 1931.

B.S., University of Washington, 1924; M.S., Columbia University, 1930.

GRANT, JOHN GRAY, Professor and Head of Hygiene, 1936, 1930.

B.A., McMaster University, Toronto, 1919; M.D., University of Manitoba, 1924.

GREENE, GUY SHEPARD, Professor and Head of Public Speaking, 1930.

A.B., Hobart College, 1920; Ph.D., Cornell University, 1926.

GREGG, HUGH CARLETON, Business Manager and Secretary, 1933.

Ph.B., University of Chicago, 1921; A.M., *ibid.*, 1923.

HAMMER, BERNARD WERNICK, Professor of Dairy Bacteriology, 1916, 1911.

B.S.A., University of Wisconsin, 1908; Ph.D., University of Chicago, 1920.

HANSEN, JOANNE M., Professor and Head of Applied Art, 1920, 1915.

Diploma, Pratt Institute; B.A., Iowa State Teachers College, 1917; Certificate, Supervisor of Art, Columbia University, 1924; M.A., *ibid.*, 1924.

HELSEY, MAURICE D., Dean of Junior College and Director of Personnel for Men, 1933, 1915.

B.S.A., Ohio State University, 1914; M.S., Iowa State College, 1916.

HENDERSON, EARL WILTON, Professor of Poultry Husbandry, 1930.

B.S.A., University of Missouri, 1921; M.A., *ibid.*, 1924; Ph.D., University of Illinois, 1930.

HIXON, RALPH MALCOLM, Professor of Chemistry, 1929, 1923.

B.S., Iowa State College, 1917; Ph.D., University of Wisconsin, 1921.

HOLL, DIO LEWIS, Professor of Mathematics, 1934, 1925.

A.B., Manchester College, 1917; A.M., Ohio State University, 1920; Ph.D., University of Chicago, 1925.

HOYT, ELIZABETH ELLIS, Professor of Economics and Home Management, 1927, 1925.

A.B., Boston University, 1913; A.M., Radcliffe College, 1924; Ph.D., *ibid.*, 1925.

HUGHES, HAROLD DE MOTT, Professor of Farm Crops, 1910.

B.S., University of Illinois, 1907; M.S.A., University of Missouri, 1908.

HUGHES, RAYMOND MOLLYNEAUX, President Emeritus, 1936, 1927.

A.B., Miami University, 1893; M.Sc., Ohio State University, 1897; LL.D., Miami University, 1927; LL.D., Coe College, 1928; LL.D., Iowa State College, 1936.

HUNTER, WILLIAM L., Professor and Head of Industrial Arts, 1931, 1927.

B.A., Iowa State Teachers College, 1919; M.A., Columbia University, 1926.

- IVERSON, CARROLD A., Professor of Dairy Industry, 1930, 1916.  
B.S. (Dairying), South Dakota State College, 1915; M.S., Iowa State College, 1917.
- JONES, W. PAUL, Professor of English, 1932, 1931.  
A.B., Wabash College, 1913; Ph.D., Cornell University, 1925.
- KEREKES, FRANK, Professor of Civil Engineering, 1931, 1920.  
B.S., College of the City of New York, 1917; C.E., Columbia University, 1920.
- KILDEE, HENRY HERBERT, Dean of Agriculture, 1933, 1908.  
B.S.A., Iowa State College, 1908; M.S., *ibid.*, 1917.
- KIMBALL, ALLEN HOLMES, Professor and Head of Architectural Engineering, 1915, 1914.  
B.L. (Arch.), University of California, 1910; B.S. (Arch.), Massachusetts Institute of Technology, 1911; M.S. (Arch), *ibid.*, 1912.
- KNIGHT, HARRY H., Professor of Entomology, 1934, 1924.  
B.S., Cornell University, 1914; Ph.D., *ibid.*, 1920.
- LAGRANGE, WILLIAM F., Professor of Animal Husbandry, 1920, 1917.  
B.S., Iowa State College, 1917; M.S., *ibid.*, 1920.
- LANCELOT, WILLIAM H., Professor of Vocational Education, 1923, 1918.  
B.S., Iowa State College, 1919; D.Ed., Miami University, 1932.
- LEVINE, MAX, Professor in Charge of Bacteriology, 1933, 1913.  
S.B., Massachusetts Institute of Technology, 1912; Ph.D., State University of Iowa, 1922.
- LINDSTROM, ERNEST W., Professor and Head of Genetics, Vice Dean of Graduate College, 1936, 1922.  
A.B., University of Wisconsin, 1914; Ph.D., Cornell University, 1917.
- LONSDALE, JOHN TIPTON, Professor and Head of Geology, 1935.  
A.B., University of Iowa, 1917; M.S., *ibid.*, 1921; Ph.D., University of Virginia, 1924.
- LOWE, BELLE, Professor of Foods and Nutrition, 1936, 1918.  
Ph.B., University of Chicago, 1917; M.S., *ibid.*, 1934.
- LUSH, JAY LAURENCE, Professor of Animal Husbandry, 1930.  
B.S., Kansas State Agricultural College, 1916; M.S., *ibid.*, 1918; Ph.D., University of Wisconsin, 1922.
- MACDONALD, GILMOUR BEYERS, Professor of Forestry, 1913, 1910.  
B.S.F., University of Nebraska, 1907; M.F., *ibid.*, 1914.
- MACRAE, TOLBERT, Professor and Head of Music, 1921, 1920.  
Grad., Drake University, 1906.
- MARSTON, ANSON, Senior Dean of Engineering, Research Engineer Experiment Station, 1932, 1892.  
C.E., Cornell University, 1889; D. Engr., University of Nebraska, 1925; D. Engr., Michigan State College, 1927.
- MARTIN, JOHN NATHAN, Professor of Plant Morphology and Cytology, 1917, 1911.  
A.B., Indiana University, 1907; Ph.D., University of Chicago, 1913.
- McKELVEY, JOSEPH VANCE, Professor of Mathematics, 1934, 1919.  
A.B., Cornell University, 1906; Ph.D., *ibid.*, 1909.
- MEEKER, WARREN H., Professor of Mechanical Engineering, 1907, 1891.  
M.E., Cornell University, 1891.



- MELHUS, IRVING E., Professor and Head of Botany, 1930, 1916.  
B.Sc., Iowa State College, 1906; Ph.D., University of Wisconsin, 1912.
- MILLER, CORA B., Professor and Head of Home Economics Education, 1928, 1916.  
B.S., Beloit College, 1899; Diploma, Bradley Polytechnic Institute, 1909; M.A., University of Chicago, 1924.
- MORGAN, BARTON, Professor and Head of Vocational Education, Director of Teacher Training, 1936, 1923.  
B.S., Missouri State Teachers College, 1919; M.S., Iowa State College, 1922; Ph.D., State University of Iowa, 1934.
- MORTENSEN, MARTIN, Professor and Head of Dairy Industry, 1909.  
B.S.A., Iowa State College, 1909; LL.D., Kansas State College, 1934.
- MURRAY, CHARLES, Dean of Veterinary Medicine, Professor and Head of Veterinary Hygiene, 1936, 1908.  
Pe.B., Drake University, 1906; B.S., Iowa State College, 1910; D.V.M., *ibid.*, 1912.
- NELSON, P. MABEL, Professor and Head of Foods and Nutrition, 1926, 1923.  
B.S., University of California, 1915; M.A., *ibid.*, 1916; Ph.D., Yale University, 1923.
- NELSON, VICTOR EMANUEL, Professor of Chemistry, 1923, 1919.  
B.S., University of Wisconsin, 1912; M.S., *ibid.*, 1914.
- NICKELL, PAULENA, Professor and Head of Home Management, 1936.  
B.S., University of Minnesota, 1923; M.A., Columbia University, 1926; Ph.D., University of Minnesota, 1932.
- NORMAN, ROY A., Professor of Mechanical Engineering, 1921, 1907.  
B.M.E., Iowa State College, 1903; M.E., *ibid.*, 1909.
- ODELL, HERBERT R., Professor and Head of Military Science and Tactics, 1934.  
U. S. Military Academy, 1910; Mounted Service School, 1915; Field Artillery School, 1920; Command and General Staff School, 1924; Lieut. Col., F. A.
- PAINE, FRANK D., Professor and Head of General Engineering, 1929, 1912.  
B.S. (E.E.), Iowa State College, 1909.
- PEET, LOUISE JENISON, Professor and Head of Household Equipment, 1931, 1928.  
B.A., Wellesley College, 1908; M.A., *ibid.*, 1911; Ph.D., Iowa State College, 1929.
- PICKETT, BETHEL STEWART, Professor and Head of Horticulture and Forestry, 1923.  
B.S.A., Toronto University, 1904; M.S., University of Illinois, 1906.
- RATHBONE, ROSALIE VIRGINIA, Professor and Head of Textiles and Clothing, 1931.  
B.S., Teachers College, Columbia University, 1918; M.A., *ibid.*, 1928.
- RAYMOND, WILLIAM RANDOLPH, Professor of English, 1921, 1907.  
A.B., Grinnell College, 1894.
- RICHARDSON, CHARLES HOWARD, Professor of Entomology, 1931, 1928.  
A.B., Stanford University, 1912; M.S., Harvard University, 1913; Ph.D., Columbia University, 1921.
- RICHEY, HARRY WYATT, Professor of Pomology, 1921, 1914.  
B.Sc.A., University of Nebraska, 1914.

- ROBERTS, MARIA M.**, Senior Dean of Junior College, Chairman of Loan Fund Committee, 1933, 1891.  
B.L., Iowa State College, 1890.
- SAGE, JAMES R.**, Registrar, Vice Dean of Junior College, 1920, 1915.  
B.A., Ohio State University, 1912; M.S., Rose Polytechnic Institute, 1915.
- SCHMIDT, LOUIS BERNARD**, Professor and Head of History and Government, 1930, 1906.  
Ph.B., Cornell College, 1901; A.M., *ibid.*, 1906; Litt.D., *ibid.*, 1934.
- SCHULTZ, THEODORE WILLIAM**, Professor and Head of Economics and Sociology, 1935, 1930.  
B.S., South Dakota State College, 1927; M.S., University of Wisconsin, 1928; Ph.D., *ibid.*, 1930.
- SHATTUCK, FREDRICA VAN TRICE**, Professor of Public Speaking, 1916, 1907.  
B.A., University of Wisconsin, 1905.
- SHEARER, PHINEAS STEVENS**, Professor and Head of Animal Husbandry, 1935, 1912.  
B.S., Iowa State College, 1912; M.S., *ibid.*, 1928.
- SIMS, FRANCES A.**, Director of Personnel for Women, Professor of Textiles and Clothing, 1930, 1925.  
Ph.B., University of Chicago, 1919; M.S., Simmons College, 1924.
- SMITH, EDWIN RAYMOND**, Professor and Head of Mathematics, 1921,  
A.B., University of Illinois, 1905; A.M., University of Wisconsin, 1908; Ph.D., University of Munich, 1911.
- SNEDECOR, GEORGE WADDEL**, Professor of Mathematics, Director of Statistics Laboratory, 1930, 1913.  
B.S., University of Alabama, 1905; M.A., University of Michigan, 1912.
- SPINNEY, LOUIS BEVIER**, Professor of Physics, 1897, 1891.  
B.M.E., Iowa State College, 1892; B.S. (E.E.), *ibid.*, 1893.
- STEVENSON, WILLIAM HENRY**, Professor of Soils, Vice Director of Agricultural Experiment Station, 1903, 1902.  
A.B., Illinois College, 1893; B.S.A., Iowa State College, 1905; D.Sc., Illinois College, 1923.
- SWANSON, LYDIA VICTORIA**, Professor and Head of Child Development, 1936, 1924.  
B.Sc., University of Nebraska, 1923; M.S., Iowa State College, 1931.
- SWANSON, PEARL P.**, Professor of Foods and Nutrition, 1936, 1930.  
B.S., Carleton College, 1916; M.S., University of Minnesota, 1924; Ph.D., Yale University, 1930.
- SWEENEY, ORLAND RUSSEL**, Professor and Head of Chemical and Mining Engineering, 1920.  
Sc.B. (Chem. E.), Ohio State University, 1909; M.A., *ibid.*, 1910; Ph.D., University of Pennsylvania, 1916; Ch.E., Ohio State University, 1935.
- THOMAS, BYRON HENRY**, Professor of Animal Chemistry and Nutrition 1931.  
B.S., University of California, 1922; M.S., University of Wisconsin, 1924; Ph.D., *ibid.*, 1929.
- TILDEN, WINIFRED R.**, Professor and Head of Physical Education, 1919, 1904  
B.A., Mt. Holyoke, 1903.

- VANCE, THOMAS FRANKLIN, Professor of Psychology and of Child Development, 1927, 1914.  
A.B., Coe College, 1909; M.A., University of Iowa, 1911; Ph.D., *ibid.*, 1913.
- VEENKER, GEORGE F., Professor and Head of Physical Education, 1933, 1931.  
A.B., Hope College, 1916.
- VOLZ, EMIL CONRAD, Professor of Horticulture 1928, 1914.  
B.S., Michigan Agricultural College, 1914; M.S.A., Cornell University, 1918.
- VON TUNGELN, GEORGE HENRY, Professor of Sociology, 1919, 1913.  
Ph.B., Central Wesleyan College, 1909; M.A., Northwestern University, 1910; Ph.D., Harvard University, 1926.
- WALSH, FRANK EDWARD, Professor and Head of Veterinary Obstetrics, 1931, 1919.  
D.V.M., Iowa State College, 1918.
- WELLHOUSE, WALTER H., Professor of Zoology, 1934, 1921.  
B.A., University of Kansas, 1913; M.A., *ibid.*, 1917; Ph.D., Cornell University, 1920.
- WERKMAN, CHESTER HAMLIN, Professor of Bacteriology, 1933, 1921.  
B.S., Purdue University, 1919; Ph.D., Iowa State College, 1923.
- WILCKE, HAROLD L., Professor of Poultry Husbandry, 1936, 1929.  
B.S., Iowa State College, 1927; M.S., *ibid.*, 1932; Ph.D., *ibid.*, 1935.
- WILKINSON, JOHN ANDERSON, Professor of Chemistry, 1919, 1913.  
B.Sc., Ohio State University, 1903; Ph.D., Cornell University, 1909.
- WOODROW, JAY WALTER, Professor and Head of Physics, 1930, 1921.  
B.A., Drake University, 1907; B.A., Oxford University (England), 1910; Ph.D., Yale University, 1913; LL.D., Drake University, 1931.

## ASSOCIATE PROFESSORS

- AIKMAN, JOHN M., Associate Professor of Botany, 1930, 1927.  
A.B., Nebraska Wesleyan University, 1917; A.M., *ibid.*, 1921; Ph.D., University of Nebraska, 1928.
- ALLBAUGH, LELAND G., Associate Professor of Agricultural Economics, 1935, 1918.  
B.S., Iowa State College, 1919; M.S., *ibid.*, 1928.
- ALLEN, EDWARD SWITZER, Associate Professor of Mathematics, 1921.  
A.B., Harvard University, 1909; A.M., *ibid.*, 1910; Ph.D., *ibid.*, 1914.
- ANDERSON, ARTHUR LAWRENCE, Associate Professor of Animal Husbandry, 1922, 1920.  
B.S., University of Minnesota, 1916; M.S., Iowa State College, 1922.
- ATANASOFF, JOHN VINCENT, Associate Professor of Mathematics and Physics, 1936, 1925.  
B.S., University of Florida, 1925; M.S., Iowa State College, 1926; Ph.D., University of Wisconsin, 1930.
- AYRES, QUINCY CLAUDE, Patent Manager, Associate Professor of Agricultural Engineering, 1921, 1920.  
B.S., University of Mississippi, 1912; B.E., *ibid.*, 1912; C.E., *ibid.*, 1920.
- BENEDICT, LERAY DOIG, Associate Professor of Economics, 1927, 1925.  
A.B., University of Michigan, 1915; M.A., *ibid.*, 1925.

- BOWERS, CHARLES F.**, Associate Professor of Architectural Engineering, 1934, 1928.  
B.S., North Dakota Agricultural College, 1928; M.Arch., Carnegie Institute, 1935.
- BRASHEAR, VIVIAN J.**, Associate Professor of Household Equipment, 1929, 1917.  
B.S., Iowa State College, 1917; M.S., *ibid.*, 1928.
- BROWN, LYNN T.**, Associate Professor of Mechanical Engineering, 1930, 1927.  
B.S., Iowa State College, 1926.
- CALVERT, JOHN F.**, Associate Professor of Electrical Engineering, 1936.  
B.S. (E.E.), University of Missouri, 1922; E.E., *ibid.*, 1924; M.S., University of Pittsburgh, 1930; Ph.D., *ibid.*, 1936.
- CARR, PERCY HAMILTON**, Associate Professor of Physics, 1932, 1930.  
B.S., Furman University, 1925; M.S., University of North Carolina, 1926; Ph.D., Cornell University, 1930.
- CLARK, NORMAN ASHWELL**, Associate Professor of Chemistry, 1927, 1921.  
B.S.A., University of Alberta, 1918; M.A., University of Toronto, 1919; Ph.D., *ibid.*, 1921.
- COOK, HERBERT CLARE**, Associate Professor of Government, 1930, 1928.  
B.A., Iowa State Teachers College, 1922; M.A., State University of Iowa, 1925; Ph.D., *ibid.*, 1926.
- COOPER, ESTHER L.**, Associate Professor of English, 1916, 1909.  
Ph.B., State University of Iowa, 1903; M.A., University of Chicago, 1925.
- DAASCH, HARRY LAWRENCE**, Associate Professor of Mechanical Engineering, 1935, 1929.  
B.S., Iowa State College, 1925; E. Met., Colorado School of Mines, 1927; M.E., Iowa State College, 1930; M.S., *ibid.*, 1933.
- DICKERSON, IRA WILMER**, Acting Associate Professor of Agricultural Engineering, 1935.  
B.S. (E.E.), University of Illinois, 1909.
- DUNAGAN, WALTER MATHEW**, Associate Professor of Theoretical and Applied Mechanics, 1933, 1924.  
A.B., Simpson College, 1919; B.S., Iowa State College, 1923; C.E., *ibid.*, 1928; M.S., *ibid.*, 1930.
- DUNBAR, RALPH M.**, Assistant Librarian, 1925, 1924.  
B.A., George Washington University, 1912; M.A., Columbia University, 1914.
- EDGAR, RACHEL HARTMAN**, Associate Professor of Chemistry, 1928, 1924.  
B.A., Ohio State University, 1917; B.S., *ibid.*, 1918; M.S., *ibid.*, 1920; Ph.D., *ibid.*, 1925.
- FIRKINS, BRUCE JUDSON**, Associate Professor of Soils, 1926, 1918.  
B.S., Iowa State College, 1917; M.S., *ibid.*, 1918.
- FISHER, MABEL C.**, Associate Professor of Applied Art, 1925, 1923.  
Diploma, Pratt Institute, 1923.
- FITZSIMMONS, JOHN ROBERT**, Associate Professor of Landscape Architecture, 1936, 1924.  
B.S., Colorado Agricultural College, 1920; M.L.A., Harvard University, 1923.
- FOSTER, JOHN ELDEN**, Dean of the Summer Quarter, Associate Professor of Vocational Education, 1922.  
B.A., Western College, 1897; B.A., Yale University, 1898.

- FRIANT, REGINA JOSEPHINE, Associate Professor of Home Economics Education, 1925, 1923.  
Ph.B., University of Chicago, 1916; M.A., *ibid.*, 1922.
- FRITZ, MARTIN FREDERICK, Associate Professor of Psychology, 1932, 1927.  
B.S., Kansas State College, 1924; M.S., *ibid.*, 1925; Ph.D., University of Chicago, 1931.
- GENAUX, CHARLES M., Associate Professor of Forestry, 1935.  
B.S. (For.), Pennsylvania State Forest School, 1924; M.S. (For.), University of Idaho, 1929.
- GOSS, EMERY FOX, Associate Professor of Dairy Industry, 1919.  
B.S. (Dairying), Iowa State College, 1915; M.S., *ibid.*, 1916.
- GOUWENS, CORNELIUS, Associate Professor of Mathematics, 1926, 1920.  
B.S., Northwestern University, 1910; A.M., University of Illinois, 1911; Ph.D., University of Chicago, 1924.
- GWYNNE, CHARLES SUMNER, Associate Professor of Geology, 1931, 1927.  
A.B., Cornell University, 1907; M.S., Syracuse University, 1925; Ph.D., Cornell University, 1927.
- HABER, ERNEST S., Associate Professor of Horticulture, 1936, 1920.  
B.S., Ohio State University, 1918; M.S., Iowa State College, 1922; Ph.D., *ibid.*, 1928.
- HAMLIN, HERBERT M., Associate Professor of Vocational Education, 1923, 1920.  
B.S., Iowa State College, 1916; M.S., *ibid.*, 1922; Ph.D., University of Chicago, 1931.
- HANSEN, ELMER NEIL, Associate Professor of Dairy Husbandry, 1929.  
B.Sc., University of Minnesota, 1923; M.S., Iowa State College, 1925.
- HARRIS, HALBERT M., Associate Professor of Zoology and Entomology, 1935, 1923.  
B.S., Mississippi Agricultural and Mechanical College, 1923; M.S., Iowa State College, 1925; Ph.D., *ibid.*, 1928.
- \*HARTER, WILLIAM LEWIS, Associate Professor of Sociology, 1919, 1917.  
A.B., McPherson College, Kansas, 1904; M.S., Iowa State College, 1918.
- HAWLEY, OSCAR HATCH, Associate Professor of Music, 1926, 1920.
- HEADLEY, LEWIS M., Associate Professor of Mechanical Engineering, 1936, 1924.  
B.M.E., Ohio State University, 1924.
- HEMPSTEAD, JEAN CHARLES, Associate Professor of General Engineering, 1936, 1930.  
B.S., Iowa State College, 1926; M.A., University of Pennsylvania, 1930.
- HERR, GERTRUDE A., Associate Professor of Mathematics, 1924, 1913.  
B.S., Iowa State College, 1907; M.S., *ibid.*, 1917.
- HEWITT, EARL ALBON, Associate Professor of Veterinary Physiology, 1929, 1915.  
A.B., Des Moines College, 1914; B.S., Iowa State College, 1915; D.V.M., *ibid.*, 1918; M.S., University of Minnesota, 1929; Ph.D., *ibid.*, 1931.
- HOGREFE, PEARL, Associate Professor of English, 1931.  
A.B., Southwestern College, 1910; A.M., University of Kansas, 1913; Ph.D., University of Chicago, 1927.

- \*HOPKINS, JOHN ABEL, JR.**, Associate Professor of Agricultural Economics, 1925, 1921.  
B.S., Delaware, 1917; M.A., Harvard University, 1921; Ph.D., *ibid.*, 1924.
- HUMMEL, JESSE GREENVILLE**, Associate Professor of Mechanical Engineering, 1910, 1902.  
B.M.E., Iowa State College, 1902; M.E., *ibid.*, 1914.
- JENNINGS, WILLIAM HARNEY**, Associate Professor of Chemistry, 1931, 1923.  
B.S., North Carolina State College, 1923; Ph.D., Iowa State College, 1927.
- KUNERTH, WILLIAM**, Associate Professor of Physics, 1916, 1907.  
A.B., University of Wisconsin, 1904; M.A., *ibid.*, 1910; Ph.D., University of Chicago, 1921.
- LANG, PAULUS**, Associate Professor of English, 1932, 1920.  
A.B., Augustana College, 1918; M.A., University of Illinois, 1920.
- LAUER, ALVHH R.**, Associate Professor of Psychology, 1930, 1925.  
B.A., McPherson College, 1922; M.A., University of Iowa, 1925; M.S., Iowa State College, 1928; Ph.D., Ohio State University, 1929.
- LOOMIS, WALTER E.**, Associate Professor of Botany, 1927.  
B.S., University of Illinois, 1921; M.S., Cornell University, 1922; Ph.D., *ibid.*, 1924.
- LORCH, FRED WILLIAM**, Associate Professor of English, 1932, 1921.  
A.B., Knox College, 1918; M.A., University of Iowa, 1928; Ph.D., *ibid.*, 1936.
- LUCAS, ALFRED MARTIN**, Associate Professor of Zoology and Embryology, 1935.  
A.B., Wabash College, 1924; Ph.D., Washington University, 1929.
- MAJOR, CHARLES CURTIS**, Associate Professor of Mechanical Engineering, 1908.  
M.E., Bloomsburg State Normal School, Pa., 1891; M.E., Cornell University, 1898.
- MATLACK, JESSE B.**, Associate Professor of Military Science and Tactics, 1936, 1933.  
U. S. Military Academy, 1917; Graduate Field Artillery School, Battery Officers' Course, 1925; Graduate, Field Artillery School, Advanced Course, 1933; Major, F. A.
- MCCLAINE, FRED H.**, Associate Professor of Electrical Engineering, 1919.  
B.S. (E.E.), University of Illinois, 1910.
- \*MCKIBBEN, EUGENE GEORGE**, Associate Professor of Agricultural Engineering, 1928.  
B.S., Iowa State College, 1922; M.S. (A.E.), University of California, 1927.
- MENZE, LOUIS EDMOND**, Associate Professor of Physical Education, 1931, 1928.  
B.S., Missouri State Teachers College, 1923.
- MERCHANT, IVAL ARTHUR**, Associate Professor of Veterinary Hygiene, 1934, 1925.  
D.V.M., Colorado State College, 1924; M.S., Iowa State College, 1928; Ph.D., *ibid.*, 1933; C.P.H., Yale University, 1934.
- MOODY, V. ALTON**, Associate Professor of History, 1930, 1925.  
A.B., Meridan College, 1912; M.A., Tulane University, 1913; Ph.D., University of Michigan, 1923.



- MOYER, RALPH ALTON**, Associate Professor of Civil Engineering, 1933, 1921.  
B.S. (C.E.), Lafayette College, 1920; M.S., Iowa State College, 1925; C.E., *ibid.*, 1934.
- MURRAY, WILLIAM GORDON**, Associate Professor of Agricultural Economics, 1931, 1925.  
B.A., Coe College, 1924; M.A., Harvard University, 1925; Ph.D., University of Minnesota, 1932.
- NAYLOR, NELLIE MAY**, Associate Professor of Chemistry, 1928, 1909.  
B.A., State University of Iowa, 1908; M.S., Iowa State College, 1918; Ph.D., Columbia University, 1923.
- NICHOLS, HARRY E.**, Associate Professor of Horticulture, 1935, 1918.  
B.S., Iowa State College, 1917; M.S., *ibid.*, 1930.
- O'BRYAN, EDNA**, Associate Professor of Applied Art, 1935, 1925.  
Graduate of Pratt Institute, 1918; B.S., Central Missouri State Teachers College, 1930.
- OHLSON, MARGARET ALEXANDER**, Associate Professor of Foods and Nutrition, 1935.  
B.A., Washington State College, 1923; M.S., State University of Iowa, 1930; Ph.D., *ibid.*, 1934.
- OLSON, OSCAR ANTON**, Associate Professor and Head of Engineering Drawing, 1936, 1913.  
B.M.E., Iowa State College, 1908; M.E., *ibid.*, 1914.
- OTOPALIK, HUGO**, Associate Professor of Physical Education, 1931, 1920.  
A.B., University of Nebraska, 1918.
- PARK, O. WALLACE**, Associate Professor of Apiculture, 1925, 1918.  
B.S., Kansas State College, 1917; M.S., Iowa State College, 1920; Ph.D., *ibid.*, 1924.
- PLAGGE, HERBERT JOHN**, Associate Professor of Physics, 1918, 1909.  
B.S., Northwestern University, 1906; M.A., University of Wisconsin, 1910.
- PORTER, R. HOWARD**, Associate Professor of Botany and Agronomy, 1931, 1919.  
B.S., Iowa State College, 1918; M.S., *ibid.*, 1920; Ph.D., *ibid.*, 1930.
- REID, MARGARET GILPIN**, Associate Professor of Economics, 1936, 1930.  
B.S. (H.Ec.), University of Manitoba, 1921; Ph.D., University of Chicago, 1931.
- ROBINSON, PIERRE G.**, Associate Professor of Mathematics, 1930, 1922.  
B.S., University of Chicago, 1914; M.S., *ibid.*, 1922; Ph.D., *ibid.*, 1925.
- ROSS, EARLE DUDLEY**, Associate Professor of History, 1923.  
Ph.B., Syracuse University, 1909; Ph.M., *ibid.*, 1910; A.M., Cornell University, 1912; Ph.D., *ibid.*, 1915.
- ROUDEBUSH, ROY E.**, Associate Professor of Mechanical Engineering, 1925, 1909-1912.  
A.B., Indiana University, 1903; M.E., Cornell University, 1907.
- RUNNELLS, RUSSELL ALGER**, Associate Professor of Veterinary Pathology, 1930.  
D.V.M., Michigan State College, 1916; M.S., University of Michigan, 1930.
- \*RUTHERFORD, GEDDES WILLIAM**, Associate Professor of Government, 1925.  
A.B., University of Missouri, 1913; A.M., Harvard University, 1916.

- SCHILLETTER, JULIAN CLAUDE**, Associate Professor of Horticulture, 1936, 1922.  
B.S., Clemson College 1922; M.S., Iowa State College, 1923; Ph.D., *ibid.*, 1930.
- SETTLES, O.**, Associate Professor of Textiles and Clothing, 1924, 1923.  
B.S., Columbia University, 1920.
- SEXAUER, THEODORE E.**, Associate Professor of Vocational Education, 1929, 1928.  
B.S. (Agr.), Iowa State College, 1909; B.S., (Ag.Ed.), M.S., *ibid.*, 1918; M.A., Columbia University, 1926; Ph.D., Cornell University, 1928.
- SHARP, MARLAY A.**, Associate Professor of Agricultural Engineering, 1931, 1925.  
B.S., University of Nebraska, 1915; M.S., Iowa State College, 1928.
- SHEPHERD, GEOFFREY SEDDON**, Associate Professor of Agricultural Economics, 1935, 1925.  
B.S.A., University of Saskatchewan, 1924; M.S., Iowa State College, 1925; Ph.D., Harvard University, 1932.
- SIMPSON, ROBERT I.**, Associate Professor of Physical Education, 1931, 1926.  
B.S., University of Missouri, 1917.
- SKERRY, HARRY ALLEN**, Associate Professor of Military Science and Tactics, 1936.  
B.S. (C.E.), University of Colorado, 1912; Major, Corps of Engineers.
- SMITH, ERMA**, Associate Professor of Physiology, 1927, 1926.  
A.B., University of Kansas, 1920; M.A., Vassar College, 1922; Ph.D., University of Chicago, 1926; M.D., Rush Medical College, 1933.
- SMITH, FREDERICK BUREAN**, Associate Professor of Soils, 1932, 1922.  
B.S., University of Georgia, 1922; M.S., Iowa State College, 1923; Ph.D., *ibid.*, 1926.
- STARBUCK, ARWARD**, Associate Professor of English, 1924, 1913.  
A.B., University of Arkansas, 1908; A.M., University of Chicago, 1922.
- STARRAK, JAMES ABEL**, Associate Professor of Vocational Education, 1926, 1920.  
B.S., Iowa State College, 1921; M.S., *ibid.*, 1922; Ph.D., Boston University, 1932.
- STEPHENS, MARIE**, Associate Professor of Textiles and Clothing, 1926, 1920.  
B.S. (H.Ec.), Iowa State College, 1911.
- STEWART, LOWELL O.**, Personnel Officer of Engineering Division, 1935, 1924.  
B.S. (C.E.), Michigan State College, 1917; M.S., Iowa State College, 1927; C.E., *ibid.*, 1928.
- STILES, HAROLD**, Associate Professor of Physics, 1915, 1914.  
Ph.B., Kenyon College, 1896; A.M., Harvard University, 1904; Ph.D., Northwestern University, 1909.
- SUTHERLAND, ELIZABETH**, Associate Professor of Foods and Nutrition, 1936.  
B.S., University of Wisconsin, 1919; M.S., *ibid.*, 1927.
- THOMSON, ROY BERTRAND**, Associate Professor of Forestry, 1934.  
B.S., University of Minnesota, 1925; M.F., Yale University, 1928.
- TOMPKINS, DORA GILBERT**, Associate Professor of English, 1919, 1905.  
A.B., Monmouth College, 1893; A.M., University of Chicago, 1921.

- TURNER, MARCIA E., Associate Professor of Home Economics Education, 1922, 1919.  
B.S., Kansas State College, 1917; M.A., University of Chicago, 1919.
- VIFQUAIN, RUSSELL MANNING, Personnel Officer of Agricultural Division and Director of Short Courses, 1920.  
A.B., Nebraska Wesleyan University, 1915; M.S., University of Missouri, 1917; B.S. (Ed.), Nebraska Wesleyan University, 1927.
- WAKELEY, RAYMOND EARL, Associate Professor of Sociology, 1935, 1930.  
B.S., Pennsylvania State College, 1917; M.S., University of Wisconsin, 1924; Ph.D., Cornell University, 1928.
- WEBBER, HENRY ALBERT, Associate Professor of Chemical Engineering, 1929, 1923.  
B.S. (Ch.E.), University of Colorado, 1923; M.S., Iowa State College, 1925; Ph.D., *ibid.*, 1929.
- WENDELL, RICHARD GOODWIN, Associate Professor of English, 1936.  
B.S., Massachusetts State College, 1923; A.M., Harvard University, 1925; Ph.D., *ibid.*, 1931.
- WENTZ, JOHN BUDD, Associate Professor of Farm Crops, 1921.  
B.S.A., North Dakota Agricultural College, 1913; M.S., Cornell University, 1916; Ph.D., *ibid.*, 1928.
- WRIGHT, WALLACE, Associate Professor of Economics, 1931, 1930.  
A.B., Dartmouth College, 1919; M.A., Stanford University, 1924; Ph.D., *ibid.*, 1930.

## ASSISTANT PROFESSORS

- ANDERSON, C. ARNOLD, Sociology, 1935.  
B.A., University of Minnesota, 1927; M.A., *ibid.*, 1928; Ph.D., *ibid.*, 1932.
- ANDERSON, ERNEST WILLARD, Mathematics, 1936, 1926.  
B.S., North Dakota Agricultural College, 1926; M.S., Iowa State College, 1928; Ph.D., *ibid.*, 1933.
- ANDERSON, HAROLD WILLIAM, Electrical Engineering, 1931.  
B.S. (E.E.), University of Kansas, 1921; E.E., *ibid.*, 1929; M.S., Massachusetts Institute of Technology, 1931; Sc.D., *ibid.*, 1934.
- ANDERSON, WALTER RAYMOND, Veterinary Obstetrics, 1936, 1935.  
D.V.M., Iowa State College, 1930.
- BAKER, MERLE PORTER, Dairy Industry, 1926, 1922.  
B.S., Iowa State College, 1921; M.S., *ibid.*, 1923; Ph.D., *ibid.*, 1931.
- BEARD, FRED J., Animal Husbandry, 1932.  
B.S., Oklahoma Agricultural and Mechanical College, 1920; M.S., Iowa State College, 1924.
- BECKMAN, RICHARD W., Technical Journalism, 1931.  
B.S., Iowa State College, 1925.
- BENEDICT, ARIEL A., Physics, 1919.  
A.B., Ohio Wesleyan University, 1913; A.M., Ohio State University, 1915.
- BERKEY, PAUL AINSWORTH, Military Science and Tactics, 1936.  
A.B., Columbia University, 1919; Capt., F. A.
- BIRD, EMERSON W., Dairy Industry and Chemistry, 1928, 1923.  
B.S., Pennsylvania State College, 1923; Ph.D., Iowa State College, 1929.

- BRANDT, A. E., Mathematics, 1930, 1924.**  
B.S., Iowa State College, 1917; M.S., *ibid.*, 1926; Ph.D., *ibid.*, 1932.
- BROWN, ORAL A., Electrical Engineering, 1929, 1924.**  
B.S. (E.E.), West Virginia University, 1924; M.S., Iowa State College, 1925; Ph.D., *ibid.*, 1932.
- BUTLER, LEE WRIGHT, Physics, 1921, 1919.**  
A.B., Simpson College, 1914.
- CHADDERDON, HESTER, Home Economics Education, 1929.**  
B.S., University of Nebraska, 1924; M.A., University of Chicago, 1928.
- COOK, THOMAS L., Economics, 1936, 1926.**  
B.S., Iowa State College, 1926; M.S., *ibid.*, 1927.
- DANIELLS, MARIAN ELIZABETH, Mathematics, 1919, 1914.**  
A.B., Kalamazoo College, 1908; A.B., University of Chicago, 1908; M.S., Iowa State College, 1919.
- DAUBERT, C. E., Physical Education, 1925, 1920.**
- DORCHESTER, CHARLES S., Farm Crops, 1916, 1913.**  
B.S., Iowa State College, 1913; M.S., University of Minnesota, 1923; Ph.D., Iowa State College, 1935.
- DUDLEY, FRED ADAIR, English, 1934, 1926.**  
A.B., Oberlin College, 1923; M.A., Columbia University, 1930.
- EDGAR, ALVIN R., Music, 1935.**  
B.A., Upper Iowa University, 1924; M.A., State University of Iowa, 1935.
- ELDREDGE, JOHN C., Farm Crops, 1921.**  
B.S. (Agronomy), Iowa State College, 1915; M.S., *ibid.*, 1925; Ph.D., *ibid.*, 1933.
- ESPE, DWIGHT LEONARD, Dairy Husbandry, 1930.**  
B.S., Iowa State College, 1922; M.S., New York Agricultural College, 1927; Ph.D., Cornell University, 1930.
- FLEMING, ANNIE WILSON, Mathematics, 1915, 1900.**  
B.S., Iowa State College, 1894; M.S., University of California, 1921.
- FOSTER, MYRTLE HINDERMAN, Physical Education, 1926.**  
B.S., University of Minnesota, 1922.
- FULLER, ELIZABETH GENEVIEVE, English, 1931, 1916.**  
A.B., University of Illinois, 1916; A.M., University of Michigan, 1922.
- GALLIGAN, WILLIAM EDWARD, Civil Engineering, 1929, 1926.**  
B.S. (C.E.), University of Missouri, 1925; M.S., Iowa State College, 1930.
- GOODMAN, GEORGE JONES, Botany, 1936, 1935.**  
A.B., University of Wyoming, 1929; M.S., Washington University, 1930; Ph.D., *ibid.*, 1933.
- GOULDING, FERN A., Hygiene, 1930, 1929.**  
R.N., University of Michigan, 1913; A.B., Olivet College, 1925.
- HANSON, A. MAURICE, Landscape Architecture, 1934.**  
B.S., Iowa State College, 1928.
- HARTMAN, GEORGE BERNHARDT, Forestry, 1935.**  
B.S. (For.), Iowa State College, 1917.
- HAUSRATH, ALFRED H., JR., Vocational Education, 1936, 1927.**  
B.S., Iowa State College, 1922; M.S., *ibid.*, 1929.

HAYDEN, ADA, Botany, 1919, 1910.

B.S., Iowa State College, 1908; M.S., Washington University, 1910; Ph.D., Iowa State College, 1918.

HENDERSON, ANNA M., Applied Art, 1919, 1916.

Diploma, Minneapolis School of Design and Normal Art, 1915.

HENDRICKSON, GEORGE OSCAR, Zoology, 1930, 1925.

B.A., Iowa State Teachers College, 1921; M.S., Iowa State College, 1926; Ph.D., *ibid.*, 1929.

HESSLER, VICTOR PETER, Electrical Engineering, 1936, 1926.

B.Sc., Oregon State College, 1926; M.S., Iowa State College, 1927; Ph.D., *ibid.*, 1934.

HINRICHSSEN, JOHN JAMES LUETT, Mathematics, 1930, 1929.

B.S., Iowa State College, 1925; A.M., Harvard University, 1927; Ph.D., *ibid.*, 1929.

HOLBERT, J. C., Animal Husbandry, 1929, 1923.

B.S., Iowa State College, 1923; M.S., *ibid.*, 1925.

\*HORNING, WALTER H., Forestry, 1929.

B.S., Pennsylvania State Forest School, 1914; M.S., University of California, 1928.

HUNTER, HELEN HAMMO, Home Economics Education, 1936, 1935.

B.S., University of Idaho, 1928.

\*JENSEN, VERNON P., Theoretical and Applied Mechanics, 1932, 1931.

B.S. (C.E.), University of Illinois, 1929; M.S. (T.&A.M.), *ibid.*, 1931; Ph.D., Iowa State College, 1936.

JOHNS, IRAL BROWN, JR., Chemistry, 1931, 1926.

B.S., Knox College, 1924; Ph.D., Iowa State College, 1930.

JOHNSON, MAURICE JOSEPH, Veterinary Surgery, 1936, 1932.

D.V.M., Iowa State College, 1932.

KALAR, SARA BLAINE, Hygiene, 1930.

M.D., Keokuk Medical College, 1903.

KEHLENBECK, ALFRED PAUL, Modern Languages, 1935.

B.A., State University of Iowa, 1927; M.A., *ibid.*, 1928; Ph.D., University of Wisconsin, 1934.

KING, WALTER BERNARD, Chemistry, 1931, 1923.

B.S., University of Illinois, 1923; M.S., Iowa State College, 1924; Ph.D., *ibid.*, 1930.

LARSEN, JULIUS A., Forestry, 1924.

B.A., Yale, 1908; M.F., *ibid.*, 1910; Ph.D., Iowa State College, 1936.

LEITH, THOMAS SEETER, Veterinary Anatomy, 1929, 1916.

D.V.M., Iowa State College, 1914.

L'ENGLE, LOUISE, Foods and Nutrition, 1929.

B.A., Goucher College, 1922; M.S., Teachers College, Columbia University, 1929.

\*LENROW, BERNARD, Public Speaking, 1932, 1930.

A.B., Cornell University, 1926.

LEWIS, JOHN H., JR., Military Science and Tactics, 1932.

U. S. Military Academy, 1918; Graduate, Field Artillery School, Basic Course, 1920; Capt. F. A.

- LIGHTBURN, FRANK E.**, Theoretical and Applied Mechanics, 1936, 1931.  
B.S. (E.E.), University of Colorado, 1931; M.S., Iowa State College, 1935.
- LYKKEN, LOUIS**, Chemistry, 1928, 1927.  
B.S., South Dakota School of Mines, 1927; Ph.D., Iowa State College, 1933.
- LIVINGSTON, EVERETT GORDON**, Industrial Arts, 1931.  
B.S., Kansas State Teachers College, 1926; M.S., Iowa State College, 1930.
- LOWENBERG, MIRIAM ELIZABETH**, Foods and Nutrition, and Child development, 1932, 1927.  
Ph.B., University of Chicago, 1918; M.S., Iowa State College, 1929.
- \***LYLE, MARY S.**, Home Economics Education, 1930, 1923.  
B.S., Purdue University, 1921; M.S., Iowa State College, 1924.
- MANNING, TRUMAN WEST**, Economics, 1930, 1924.  
B.S., Iowa State College, 1911; M.S., *ibid.*, 1929.
- MARLOW, KYLE FAYETTE**, Modern Languages, 1931, 1925.  
B.L., University of Minnesota, 1899; M.A., French School, Middlebury, Vt., 1923.
- MARVIN, KENNETH R.**, Technical Journalism, 1934, 1923.  
B.S., Iowa State College, 1923.
- MCCLESKEY, CHARLES SHELTON**, Bacteriology, 1936, 1927.  
B.S., Texas A. & M. College, 1924; M.S., Iowa State College, 1926; Ph.D., *ibid.*, 1930.
- MCCRACKEN, EARL C.**, Physics, 1934, 1919.  
B.S., Drake University, 1918; M.S., Iowa State College, 1929; Ph.D., University of Minnesota, 1934.
- McMILLEN, ELLIOTT LEE**, Chemical Engineering, 1935.  
B.S. (Chem.E.), University of Minnesota, 1923; M.S. (Chem.E.), *ibid.*, 1927; Ph.D., *ibid.*, 1931.
- MILLER, FRANK CLIFFORD**, Engineering Drawing, 1919.  
B.S., James Millikin University, 1909; M.S., Iowa State College, 1935.
- MURPHY, GLENN**, Theoretical and Applied Mechanics, 1934, 1932.  
B.S. (C.E.), University of Colorado, 1929; M.S. (C.E.), *ibid.*, 1930; M.S. (C.E.), University of Illinois, 1932; Ph.D., Iowa State College, 1935.
- NIELSEN, HERLUF P.**, Mechanical Engineering, 1935.  
B.S. (M.E.), University of Nebraska, 1924; M.M.E., Rensselaer Polytechnic Institute, 1925; Ph.D., University of Minnesota, 1933.
- OBERHEIM, GRACE MYRTLE**, Loan Librarian, 1930, 1923.  
A.B., University of Wisconsin, 1920.
- OLSON, BEATRICE T.**, Home Economics Education, 1936, 1924.  
B.S., Iowa State College, 1923; M.S., *ibid.*, 1925.
- PAUSTIAN, RAYMOND GEORGE**, Civil Engineering, 1936, 1930.  
B.S., Iowa State College, 1929; M.S., *ibid.*, 1931; C.E., *ibid.*, 1934.
- PETERSON, JOHN BOOTH**, Soils, 1933, 1928.  
B.S., Oregon State College, 1928; M.S., Iowa State College, 1929; Ph.D., *ibid.*, 1936.
- PHILLIPS, S. DALE**, Architectural Engineering, 1930, 1928.  
Graduate in Art, Minneapolis School of Art, 1927.

- POTGIETER, FANNIE, Textiles and Clothing, 1934, 1931.  
B.A., State University of Iowa, 1922; M.A., University of Washington, 1928.
- PRATT, GROVER MARTIN, Engineering Drawing, 1928, 1925.  
B.S. (Arch.), Syracuse University, 1911.
- RICHARDS, LORENZO ADOLPH, Soils and Physics, 1935.  
B.S., Utah State College, 1926; M.A., *ibid.*, 1927; Ph.D., Cornell University, 1931.
- ROSEBROOK, LEE EDWARD, Hygiene, 1936.  
M.D., State University of Iowa, 1933.
- ROTHACKER, RALPH RUDOLPH, Landscape Architecture, 1925, 1922.  
B.S., Ohio State University, 1918; M.S., Iowa State College, 1924.
- RUSSELL, MABEL, Applied Art, 1919, 1916.  
Diploma, Pratt Institute, 1915; Ph.B., University of Chicago, 1925; M.S., Iowa State College, 1933.
- SASS, JOHN EUGENE, Botany, 1930, 1928.  
B.S., University of Michigan, 1924; M.S., *ibid.*, 1925; Ph.D., *ibid.*, 1929.
- \*SATER, LENORE ESTELINE, Household Equipment, 1931, 1928.  
B.S., Drake University, 1920; M.S., Iowa State College, 1930.
- SATER, VERLEE ENID, Household Equipment, 1936, 1931.  
B.A., Des Moines University, 1923; M.S., Iowa State College, 1932.
- SCHANCKE, ARTHUR NORMAN, Hygiene, 1930.  
B.S., University of South Dakota, 1923; M.D., Washington University, 1925.
- SCHRAMPFER, WILLIAM H., Economics, 1933, 1929.  
B.A., University of Iowa, 1926; J.D., *ibid.*, 1928.
- SCHMIDT, HARRY J., Physical Education, 1929, 1926.  
B.S., Iowa State College, 1925.
- SHILLING, IDA MAY, Foods and Nutrition, 1923.  
B.S., Ohio State University, 1910; M.S., University of Chicago, 1923.
- SMITH, JOHN ELIPHALET, Geology, 1917.  
B.S., Oregon Agricultural College, 1902; M.S., Iowa State College, 1911.
- SMITH, DWIGHT A., Veterinary Medicine, 1936, 1932.  
D.V.M., Iowa State College, 1932.
- STIGLER, GEORGE JOSEPH, Economics, 1936.  
B.B.A., University of Washington, 1931; M.B.A., Northwestern University, 1932.
- STORKE, HARRY P., Military Science and Tactics, 1934.  
B.S., U. S. Military Academy, 1926; Field Artillery School, 1931; Capt., F. A.
- SULLIVAN, LEONORE MARGARET, Institution Management, 1936, 1928.  
B.S., Montana State College, 1927; M.S., Iowa State College, 1929.
- TAUBER, OSCAR E., Zoology and Entomology, 1936, 1930.  
B.S., James Millikin University, 1930; M.S., Iowa State College, 1932; Ph.D., *ibid.*, 1935.
- THORNE, D. WYNNE, Agronomy, 1936, 1934.  
B.S., Utah State Agricultural College, 1933; M.S., Iowa State College, 1934; Ph.D., *ibid.*, 1936.

**TRUSKOWSKI, JOSEPH E., Physical Education, 1932.**

A.B., University of Michigan, 1930.

**VANGIESEN, W. O., Military Science and Tactics, 1934.**

B.S., Michigan State College, 1926; Engineer School, 1932; Capt., Corps of Engineers.

**WALLER, ERNEST FREDERICK, Veterinary Pathology, 1936, 1934.**

D.V.M., Iowa State College, 1931.

**WARNER, ELEANOR FRANCES, Serials Librarian, 1930, 1923.**

B.A., Ohio Wesleyan University, 1912; M.A., *ibid.*, 1913; B.L.S., University of Illinois, 1919.

**WATERS, NELSON FENN, Poultry Husbandry, 1931.**

B.Sc., Connecticut State College, 1925; M.Sc., Harvard University, 1930; D.Sc., *ibid.*, 1931.

**\*WHAN, FOREST LIVINGS, Public Speaking, 1932, 1930.**

B.S., Kansas State College, 1928; M.A., University of Illinois, 1931.

**WILCOX, WALTER W., Agricultural Economics, 1935.**

B.S., Iowa State College, 1928; M.S., University of Illinois, 1930.

**WILLIS, BENJAMIN SUTTON, Electrical Engineering, 1927, 1924.**

B.S. (E.E.), University of Minnesota, 1917; E.E., Iowa State College, 1926; M.S., *ibid.*, 1929.

**WILLSON LAWRENCE HERRICK, Physics, 1920, 1919.**

A.B., Valparaiso University, 1913; B.S., University of Chicago, 1914.

**WOOD, THOMAS CLAGETT, Military Science and Tactics, 1936.**

B.S., Clemson College, 1924; Capt. F.A.

**YEAGER, JAMES, Physical Education, 1936.**

B.S., Kansas State College, 1931; M.A., State University of Iowa, 1935.

## INSTRUCTORS

**ADAMS, JAMES A., Zoology and Entomology, 1936, 1931.**

B.S., Ontario Agricultural College, 1931; M.S., Iowa State College, 1933; Ph.D., *ibid.*, 1935.

**ANDERSON, MABEL, Institution Management, 1932.**

B.S., University of Minnesota, 1919.

**ANDRE, FLOYD, Zoology and Entomology, 1936, 1932.**

B.S., Iowa State College, 1931; M.S., *ibid.*, 1933; Ph.D., *ibid.*, 1936.

**AYRES, DON P., Architectural Engineering, 1932.**

B.S. (Arch.), University of Illinois, 1928; M.S. (Arch.), *ibid.*, 1930.

**BENSON, RICHARD ERNEST, Chemical Engineering, 1936, 1935.**

B.S. (Chem.E.), University of Arkansas, 1935; M.S., Iowa State College, 1936.

**BERKEL, HOWARD J., Engineering Drawing, 1935.**

B.S. (C.E.), Michigan State College, 1931; M.S. (C.E.&Ec.), *ibid.*, 1933.

**BOAST, WARREN B., Electrical Engineering, 1936, 1934.**

B.S. (E.E.), University of Kansas, 1933; M.S. (E.E.), *ibid.*, 1934; Ph.D., Iowa State College, 1936.

**BOWMAN, MARY JEAN, Economics, 1934.**

A.B., Vassar, 1930; A.M., Radcliffe, 1932.



- BRANDNER, FRED A., Mathematics, 1922.  
B.S., Kansas State Teachers College, 1921; M.S., University of Chicago, 1923.
- BRECKENRIDGE, ROBERT W., Mechanical Engineering, 1929.  
B.S., Iowa State College, 1932; M.S., *ibid.*, 1934.
- BRIDGER, GROVER L., Chemical Engineering, 1936, 1935.  
B.S. (Chem.E.), Rice Institute, 1933; M.A. (Physical Chem.), *ibid.*, 1935.
- BROWN, ELLIS V., Chemistry, 1930.  
B.S., University of Illinois, 1930; Ph.D., Iowa State College, 1936.
- BROWNLEE, JEAN HANNA, Physical Education, 1936.  
A.B., University of Nebraska, 1935.
- BRYANT, HIGBEE WAYNE, Dairy Industry, 1936, 1935.  
B.S., Utah State Agricultural College, 1935; M.S., Iowa State College, 1936.
- BUCHANAN, DORIS LAVINA, Textiles and Clothing, 1935.  
B.S., University of Texas, 1931; M.A., Teachers College, Columbia University, 1933.
- CASTONGUAY, THOMAS T., Chemistry, 1934.  
B. (Met.) Engr., University of Detroit, 1931.
- CHAMBERLIN, STEPHEN J., Theoretical and Applied Mechanics, 1936, 1929.  
B.S. (C.E.), University of Illinois, 1928; M.S., Iowa State College, 1931.
- CHAPIN, MILDRED RUTH, Foods and Nutrition, 1936.  
B.A., University of Illinois, 1934; M.S., *ibid.*, 1936.
- CHASE, HOWARD, Music, 1936.
- CHITTENDEN, GERTRUDE EMMA, Child Development, 1936.  
B.S., University of Nebraska, 1931; M.A., *ibid.*, 1936.
- CLINE, LEWIS MANNING, Geology, 1936.  
B.S., Tulsa University, 1931; M.S., State University of Iowa, 1934; Ph.D., *ibid.*, 1935.
- COCHRAN, JOHN KNIGHT, History, 1936.  
B.A., University of Wisconsin, 1931; M.A., *ibid.*, 1932; Ph.D., *ibid.*, 1936.
- COCKING, ROGER MILTON, Veterinary Anatomy, 1934.  
D.V.M., Iowa State College, 1934.
- COOK, ROSALIND, Music, 1926, 1921.  
Mus. B., Ellsworth College, 1917.
- COUNTRYMAN, M. ALDEN, Engineering Drawing, 1936, 1933.  
B.S. (E.E.), University of Minnesota, 1925; M.S., Iowa State College, 1933; Ph.D., *ibid.*, 1936.
- DACHTLER, W. C., Industrial Economics, 1935.  
B.S., Iowa State College, 1930.
- DIEHL, LOIS ISABELLE, Foods and Nutrition, 1936.  
B.S., Iowa State College, 1931; M.S., *ibid.*, 1933.
- ELKINTON, CHARLES MOORE, Economics, 1934, 1933.  
B.S., M.S., University of Wisconsin, 1932.
- ENGLER, KYLE, Agricultural Engineering, 1936, 1935.  
B.S. (E.E.), Kansas State College, 1930; B.S. (A.E.), *ibid.*, 1935; M.S., Iowa State College, 1936.

FABRICIUS, N. E., Dairy Industry, 1928.

B.S., Iowa State College, 1928; M.S., *ibid.*, 1930; Ph.D., *ibid.*, 1936.

FLEMING, MABEL ALICE, English, 1912.

B.S., Iowa State College, 1911.

FOLADARE, JOSEPH, English, 1935.

B.S. California Institute, 1930; M.A., Claremont Colleges, 1931; Ph.D., Yale University, 1936.

GABRIELSON, MARY L., Textiles and Clothing, 1921.

B.S., Kansas State College, 1911; M.A., Columbia University, 1918.

GESSER, CARL C., Foundry, Mechanical Engineering, 1922.

GOEPFINGER, KATHERINE, Technical Journalism, 1935.

B.S., Iowa State College, 1924.

GREAVES, IDA CECIL, Economics, 1936, 1935.

B.A., McGill University, 1929; M.A., *ibid.*, 1930; Ph.D., London University, 1934.

GREER, JOSHUA WILBUR, Chemistry, 1930, 1928.

B.S., Western Illinois State Teachers College, 1922.

GUSTAFSON, DAGMAR CHRISTINE MAURINE, Textiles and Clothing, 1936.

B.S., University of Nebraska, 1926.

HAGER, ANNA, Zoology and Entomology, 1936, 1932.

B.S., Iowa State College, 1932; M.S., *ibid.*, 1934.

HAMMER, AVERILLE J., Chemistry, 1936, 1924.

B.S., Parsons College, 1924; M.S., Iowa State College, 1928.

HASSINGER, RUTH MARIA, Physical Education, 1935.

B.S., University of Minnesota, 1927.

HAWSE, DORIS HARTWELL, English, 1936.

B.A., University of Alabama, 1935; M.A., *ibid.*, 1936.

HENRY, LYLE KENNETH, Psychology, 1936, 1931.

B.S. Des Moines University, 1926; M.A., University of Iowa, 1931; Ph.D., *ibid.*, 1933.

HETZER, HERBERT O., Genetics, 1936, 1930.

Diploma, Hohenheim, Germany, 1927; M.S., Iowa State College, 1931; Ph.D., *ibid.*, 1935.

HIGDON, ARCHIE, Theoretical and Applied Mechanics, 1935, 1934.

B.S., South Dakota State College, 1928; M.S., Iowa State College, 1930; Ph.D., *ibid.*, 1936.

HILLYARD, LAWRENCE ROBERTSON, General Engineering, 1936.

B.S., Iowa State College, 1932; M.S., *ibid.*, 1936.

†HINES, THOMAS B., Forge Shop, Mechanical Engineering, 1920.

HOPKINS, HELEN, Physical Education, 1935.

B.S., University of Illinois, 1932.

HOSTETLER, PIUS H., Dairy Industry, 1935.

B.S., Kansas State College, 1934; M.S., Iowa State College, 1935.

JOHNSON, J. STUART, Theoretical and Applied Mechanics, 1936, 1934.

B.S. (Engr.), University of Missouri, 1932; M.S. (E.E.), *ibid.*, 1934.

†Deceased January 11, 1937.

- JULANDER, ODELL, Forestry, 1936.  
B.S., Utah State Agricultural College, 1931.
- KARLSON, ALFRED GUSTAV, Veterinary Hygiene, 1935.  
B.S., Iowa State College, 1934; D.V.M., *ibid.*, 1935.
- KEMPF, CLAYTON ARFORD, Chemistry, 1935, 1933.  
A.B., Drake University, 1930; M.S., State College of Washington, 1932.
- KIRKMAN, JOHANNA C. FEDSON, English, 1918.  
B.S., Iowa State College, 1906; M.S., *ibid.*, 1928.
- KIRKPATRICK, MARY, Foods and Nutrition, 1930.  
B.S., Kansas State College, 1919; M.S., University of Chicago, 1930.
- KITT, EMMA G., Applied Art, 1927.  
Diploma, Chicago Art Institute, 1926.
- LEPLEY, MARION C., Applied Art, 1927, 1926.  
B.S., Iowa State College, 1922; M.S., *ibid.*, 1931.
- McCLOSKEY, MARY PECKINPAUGH, Home Economics Education, 1935, 1934.  
B.S., Iowa State College, 1930; M.S., *ibid.*, 1936.
- McCOMB, A. L., Forestry, 1935, 1932.  
B.S., Pennsylvania State College, 1932; M.S., Iowa State College, 1933.
- McDOWELL, CLARENCE MERLE, Theoretical and Applied Mechanics, 1930.  
B.S. (M.E.), University of Illinois, 1924; M.S., Iowa State College, 1933.
- McMULLEN, ELLA GERTRUDE, Institution Management, 1935.  
B.S., Iowa State College, 1933.
- MATTLAND, ANDREW, Machine Shop, Mechanical Engineering, 1920.
- MARTIN, FRANK S., Chemistry, 1935, 1933.  
B.S., Kansas State College, 1933.
- MATHIS, LELAND STANFORD, English, 1936.  
A.B., Iowa State Teachers College, 1929; A.M., State College of Washington, 1931.
- MENZEL, RALPH EDGAR, Chemistry, 1934, 1929.  
B.A., Upper Iowa University, 1920.
- MEYER, ALWINE HELENE, Textiles and Clothing, 1935.  
A.B., University of Nebraska, 1920; B.S., *ibid.*, 1924; M.S., Iowa State College, 1932.
- MILBY, THOMAS THEODORE, Poultry Husbandry, 1934, 1931.  
B.S., University of Kentucky, 1931; M.S., Iowa State College, 1932; Ph.D., *ibid.*, 1934.
- MILLER, RUSSELL D., Physics, 1926.  
B.S., Iowa State College, 1921; M.S., *ibid.*, 1928.
- MILLS, BARRISS, English, 1937.  
A.B., Dartmouth College, 1934; M.A., University of Chicago, 1936.
- MOORE, PERRY A., Chemistry, 1929, 1925.  
B.S. (Chem.), Des Moines University, 1925; M.S., Iowa State College, 1926; Ph.D., *ibid.*, 1936.
- MOOREHOUSE, GRETCHEN LUMBARD, Physical Education, 1933.  
A.B., Drake University, 1930; M.S., Johns Hopkins University, 1933.
- NESS, ZENOBLA B., Applied Art, 1924.

- NIEMACK, ILZA**, Music, 1935.  
Graduate, Chicago Musical College, 1919.
- NORBY, CHARLES HAROLD**, History, 1936.  
A.B., Luther College, 1930; M.A., State University of Iowa, 1931; Ph.D., *ibid.*, 1935.
- NORTH, JOSEPH HENRY**, Public Speaking, 1936.  
A.B., University of Wisconsin, 1934; M.A., Cornell University, 1936.
- OHLSEN, EDWARD H.**, General Engineering, 1936.  
B.S. (C.E.), Iowa State College, 1926; C.E., *ibid.*, 1936.
- OLSON, HAROLD CECIL**, Dairy Industry, 1934, 1932.  
B.S., South Dakota State College, 1928; M.S., West Virginia University, 1930; Ph.D., Iowa State College, 1932.
- PEASE, LAWRENCE H.**, Animal Husbandry, 1936.  
B.S., Iowa State College, 1936.
- PETERSEN, GEORGE M.**, Ceramic Engineering, 1930.  
B.S. (L.A.), Iowa State College, 1922; B.S. (Cer.), *ibid.*, 1930.
- PINNEY, LOUIS ERWIN**, Physics, 1931, 1930.  
A.B., University of Missouri, 1925; M.A., *ibid.*, 1927.
- PRUGH, HARRY I.**, Economics, 1934, 1930.  
A.B., Coe College, 1930; M.S., Iowa State College, 1931.
- QUINTUS, PAUL E.**, Agricultural Economics, 1934.  
B.A., Coe College, 1928; M.S., Iowa State College, 1931; Ph.D., University of Minnesota, 1934.
- ROBERTSON, L. FRED**, Mathematics, 1927.  
A.B., Indiana University, 1924; A.M., *ibid.*, 1927.
- ROUDABUSH, ROBERT LEE**, Zoology, 1935, 1931.  
A.B., Lebanon Valley College, 1931; M.S., Iowa State College, 1932; Ph.D., *ibid.*, 1936.
- SAGEN, OSWALD KARL**, Mathematics, 1936.  
A.B., Luther College, 1926; Ph.D., University of Chicago, 1934.
- SCHICKELE, RAINER WOLFGANG**, Agricultural Economics, 1935.  
"Diploma-Landwirt," Berlin, College of Agriculture, 1929; Ph.D., *ibid.*, 1931.
- SEVERANCE, GRACE**, Institution Management, 1935, 1934.  
B.S., State College of Washington, 1931.
- SCHROEDER, IRA**, Carillonneur, Music, 1931.  
B.Mu., Bush Conservatory of Music, 1927.
- SHULTZ, EDNA LONGSTRETH**, English, 1935.  
A.B., Drake University, 1926.
- SIELING, DALE H.**, Chemistry, 1935, 1932.  
B.S., Kansas State College, 1931; M.S., *ibid.*, 1932; Ph.D. Iowa State College, 1936.
- SMITH, HELEN FLORENE**, Mathematics, 1907.  
A.B., Cornell University, 1902; M.S., Iowa State College, 1921.
- SPANGLER, EDWARD MERRIT**, Pattern Shop, Mechanical Engineering, 1905, 1904.
- STANERSON, BRADFORD R.**, Chemistry, 1936, 1929.  
B.S., Iowa State College, 1930; M.S., *ibid.*, 1931.

- STEVENS, DONALD S., Engineering Drawing, 1934.  
B.S., Iowa State College, 1931; M.S., *ibid.*, 1933.
- STILES, WILLIAM B., Theoretical and Applied Mechanics, 1934.  
B.S., Iowa State College, 1932.
- STONE, SIDNEY, C., Public Speaking, 1930.  
A.B., Ohio Wesleyan University, 1929; M.A., *ibid.*, 1933.
- SUNDERLIN, EDITH MARYBELLE, Child Development, 1934.  
B.S., Iowa State College, 1924; M.A., State University of Iowa, 1931.
- SWINGLE, EDITH, Bacteriology, 1934.  
B.S., Montana State College, 1928; Ph.D., University of Chicago, 1934.
- TESELLE, EUGENE ARTHUR, Dairy Industry, 1935.  
B.S., Iowa State College, 1932.
- TETER, EDNA RHOADS, Applied Art, 1927, 1925.  
B.S., Iowa State College, 1920; M.S., *ibid.*, 1933.
- TIMM, LEROY C., Physical Education, 1934.  
B.S., University of Minnesota, 1931; M.A., New York University, 1933.
- UNDERKOFER, LELAND ALFRED, Chemistry, 1935, 1928.  
A.B., Nebraska Wesleyan University, 1928; Ph.D., Iowa State College, 1934.
- VOSS, LAWRENCE JENSBY, Public Speaking, 1936.  
A.B., Cornell University, 1929; M.A., *ibid.*, 1932.
- WALKER, ALBERT LYELL, English, 1935.  
B.A., Park College, 1929; M.A., State University of Iowa, 1930; Ph.D., *ibid.*, 1936.
- WAUGH, ALICE, Applied Art, 1927.  
B.S., Missouri State University, 1916.
- WHISLER, BENJAMIN, Civil Engineering, 1936, 1930.  
B.S., Iowa State College, 1930; M.S., *ibid.*, 1932; D.Sc., Harvard University, 1936.
- WILHELM, HARLEY ALNEY, Chemistry, 1928, 1927.  
A.B., Drake University, 1923; Ph.D., Iowa State College, 1932.
- WILKINSON, WILLIAM JUSTUS, Public Speaking, 1936.  
A.B., University of Denver, 1934.
- WOOD, STANLEY NIXON, Veterinary Anatomy, 1936.  
B.Sc.A., University of Saskatchewan, 1925; D.V.M., Iowa State College, 1936.
- WOODY, OSCAR G., Architectural Engineering, 1930.  
B.S. (Arch.), Kansas State College, 1925.

## ASSISTANTS

- CALHOUN, M. LOIS, B.S., M.S., Veterinary Anatomy, 1932, 1928.
- CHADDOCK, THEODORE THOMAS, B.S., M.S., Veterinary Pathology, 1935, 1934.
- IRWIN, WILLIAM EMORY, B.S., Veterinary Physiology and Pharmacology, 1936.
- JONES, LEO MEYER, A.B., Veterinary Physiology and Pharmacology, 1935.

MAC ARTHUR, JESSIE ANDERSON, B.A., M.A., Critic Reader in English, 1936, 1914.

MEDIN, KENNETH DARREL, B.S., Dairy Industry, 1936.

NIELSEN, VERNER H., Dairy Industry, 1932.

SAFFORD, RUTH BOGARDUS, B.L., Critic Reader in English, 1936, 1908.

SLOSS, MARGARET W., B.S., M.S., Veterinary Pathology, 1929, 1923.

STEVENSON, GLADYS TIMSON, B.A., Foods and Nutrition, 1931.

### GRADUATE ASSISTANTS

ANDERSON, A. LEROY, B.S., Economics and Sociology, 1936.

ATKINSON, LUTHER JAY, B.S., M.S., Economics and Sociology, 1936.

AUSTIN, CLARENCE PRICE, B.S., M.A., Economics and Sociology, 1936.

BARR, FLORENCE, B.S., Chemistry, 1936, 1930.

BEALE, ROBERT W., B.S., Theoretical and Applied Mechanics, 1936.

BINDSCHADLER, ERNEST, B.S., M.S., Chemistry, 1935.

BOLIN, OREN, B.S., M.S., Agronomy, 1936, 1935.

BUCHANAN, BEN F., A.B., Chemistry, 1934.

COHEE, R. F., JR., B.S., M.S., 1934.

COMISH, ALISON, B.S., M.S., Economics and Sociology, 1936.

DAVIS, ARTHUR WILLIAM, B.S., M.S., Mathematics, 1936, 1930.

DAVIS, CHARLES H., B.S., M.S., Agronomy, 1936, 1935.

DAWSON, VERA L., B.S., M.S., Chemistry, 1935, 1934.

DICKEY, HOWARD CHESTER, B.S., M.S., Dairy Husbandry, 1936.

DUNBAR, RALPH E., B.S., M.A., Ph. D., Chemistry, 1936.

DUNHAM, JOHN WESLEY, B.S., M.S., Genetics, 1936.

EATON, GERALD ALMOND, B.S., Chemistry, 1935.

FARNHAM, RUTH C., B.S., Household Equipment, 1936.

FERGUSON, RUTH HUYCKE, B.S., Home Management, 1936.

FISHER, ROBERT ALEXANDER, B.S., M.S., Zoology and Entomology, 1934.

FRANZ, RAYMOND A., B.S., Ph.D., Chemistry, 1929.

GRIFFITH, ROBERT H., B.S., Chemistry, 1935.

GROSS, GEORGE LLOYD, B.S., Mathematics, 1936.

- GUNDERSON, HAROLD, B.S., M.S., Zoology and Entomology, 1935.
- HARVEY, PAUL H., B.S., Genetics, 1934.
- HELT, DON, B.S., Technical Journalism, 1936.
- HOUGHTON, EDWARD W., B.S., Electrical Engineering, 1936.
- HUNTER, JOSEPH EVERETT, JR., B.S., M.S., Chemistry, 1935.
- KELLEY, MYRON TRUMAN, B.S., M.S., Chemistry, 1934, 1933.
- McKINNEY, FLORENCE E., B.S., Home Management, 1936.
- MEASAMER, SCHÜBERT GERNT, B.S., Chemical Engineering, 1936.
- MITCHELL, NANCY BOOTH, A.B., M.S., Bacteriology, 1936, 1935.
- MOORE, FRANCIS B., B.A., Chemistry, 1936.
- MOORE, FRANK J., A.B., Chemistry, 1936.
- O'HORA, DOROTHY M., B.A., M.A., Chemistry, 1936.
- PACEVITZ, HENRY A., B.S., Chemistry, 1936.
- PATE, EVELYN REBECCA, B.S., Home Economics Education, 1936.
- PATTERSON, CHARLES ARCHLY, B.S., Zoology and Entomology, 1936.
- PLUMMER, WILLIS B., B.S., Electrical Engineering, 1936.
- POWERS, MYRON JOHN, B.S., M.S., Bacteriology, 1936, 1932.
- RAYMAN, MORTON M., B.S., Chemistry, 1934.
- RIEKE, MARLYS CRYSTAL ARLYNN, B.A., Chemistry, 1935.
- ROTHMEYER, WILLIAM R., B.S., Mechanical Engineering, 1936.
- RUBY, WILLARD R., B.S., Ph. D., Chemistry, 1931, 1930.
- SANDELL, HARRIET JEAN, B.S., Child Development, 1936.
- SHELDON, LORISSA SUTHERLAND, B.S., Institution Management, 1936, 1935.
- SMITH, ELBERT G., B.S., Chemistry, 1936.
- SNIPES, BENJAMIN THOMAS, B.S., M.S., Zoology, 1934.
- SPENCER, MARY ELIZABETH, B.S., Child Development, 1936.
- SUTTON, WILLIAM RUSSELL, A.B., Chemistry, 1935, 1934.
- STEWART, MEREDITH MARVIN, A.B., Chemistry, 1935.
- SWISLOWSKY, JACOB, B.S., M.S., Chemistry, 1934.
- TUTHILL, LEONARD DALE, A.B., M.A., Zoology and Entomology, 1935.
- VENZKE, CARL EBERT, D.V.M., Veterinary Hygiene, 1936.
- WHISTLER, ROY LESTER, B.S., M.S., Chemistry, 1935.

WHITMORE, ELTON A., B.S., Economics and Sociology, 1936.

WILLIAMS, JOHN COVINGTON, A.B., M.A., Chemistry, 1935, 1933.

ZOLLER, ELINOR, B.S., Technical Journalism, 1936.

ZWEMER, EVELYN ANNE, A.B., B.S., Home Management, 1936.

### FELLOWS AND SCHOLARS

ANDERSON, RICHARD L., A.B., Mathematics, 1936.

ARMSTRONG, WILLIAMINA ELIZABETH, B.S., M.S., Foods and Nutrition, 1934.

BABEL, FRED JOHN, B.S.A., M.S.A., Dairy Industry, 1936.

BALLARD, ROBERT G., B.S., M.S., Chemistry, 1936.

BATES, JAMES MERLIN, B.A., Mathematics, 1936.

BURDINE, N. THEODORE, A.B., A.M., Physics, 1936.

CARLSON, WARNER WILLIAM, B.S., M.S., Chemistry, 1936.

CARRITHERS, JAMES M., B.A., Economics and Sociology, 1936.

CLARE, STEWART, B.A., Zoology and Entomology, 1936, 1935.

COLE, BASIL CHAMBRUS, B.S., M.S., Bacteriology, 1936.

COOPER, NORMAN, A.B., M.A., Botany, 1936.

DAVIS, MARY JANE, B.S., Institution Management, 1936.

DUNDON, WARREN JAMES, B.S., Chemistry, 1935.

FELKER, RALPH HERMAN, B.S., Forestry, 1936.

FIETZ, BERTHA IDA, B.A., Chemistry, 1936.

FISH, VELMAR B., B.S., Chemistry, 1936.

GLYPH, EAKIN MILTON, B.S., Chemistry, 1936.

GOODWIN, RALPH ABIJAH, A.B., Physics, 1935.

GOULD, CHARLES JAY, JR., A.B., Botany, 1936.

HART, PHILIP JAMES, B.S., Physics, 1936.

HICKEY, RICHARD JAMES, B.S., Chemistry, 1936.

HIGGINS, GEORGE C., B.S., Physics, 1935, 1934.

JOHNSTON, JOSEPH REX, B.S., Agronomy, 1936.

JONES, SLOAN EARLE, B.S., M.S., Zoology and Entomology, 1936.

KLINGEBIEL, ALBERT ARNOLD, B.S., Agronomy, 1936.

LONG, GERALD L., A.B., Chemistry, 1936.



- McCoy, D. OREN, B.S., M.S., Physics, 1936, 1934.
- McNIEL, BESSIE F., B.A., Child Development, 1936.
- NICOLAYSEN, HOWARD FREDERIC, A.B., Chemistry, 1936.
- NORTON, HORACE W. III, B.S., Mathematics, 1936, 1935.
- OGG, CLYDE LESLIE, B.S., Chemistry, 1936.
- PAUL, LORNE CASWELL, B.S., M.S., Zoology and Entomology, 1936.
- RICHARD, WILLIS J., B.A., Agricultural Economics, 1936.
- ROCK, DONALD HILL, B.A., Mathematics, 1936, 1935.
- RYAN, ALDEN HOOVER, B.A., Physics, 1936, 1935.
- SHAPIRO, NATHAN B., B.S., Economics, 1936.
- SHUBERT, MORAS L., A. B., Botany, 1935.
- STANDEN, J. H., B.S., M.A., Botany, 1936.
- STEBBINS, DEAN WALDO, B.S., Physics, 1935.
- THORNE, CHARLES J., A.B., Mathematics, 1936.
- WARNER, ROBERT, A.B., Botany, 1936.
- WEBER, GEORGE RUSSELL, B.S., Bacteriology, 1936.
- YOUNG, CHARLOTTE MARIE, B.S., Foods and Nutrition, 1936.

### ADMINISTRATIVE BOARD

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## Agronomy

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BEN WALKER, '13, '24  
N. C. KINNICK, '16  
M. E. OLSON, '14, '16  
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G. H. TELLIER, '10  
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RALPH BARTLETT, '25  
PAUL CROWLEY, '10

## Animal Husbandry

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ANSON HAYES, '17  
LILLIAN STORMS, '08  
GEORGE JUDISCH  
LYMAN C. CRAIG, '28, '31  
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## Horticulture

R. S. HERRICK, '21  
ROBERT M. CLARK, '15  
L. S. GOODE, '18  
LINDLEY B. HOOPES, '17  
DAVID S. LAKE, '36

## Mechanical Engineering

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F. T. WHITING, '13  
I. R. SMITH, '05  
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GEORGE W. MORRISON, '10

## Physics

R. M. BOWIE, '29, '31, '35  
M. LUCKIESH, '12, '26  
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G. M. WISSINK, '27, '33

## Technical Journalism

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JEAN GUTHRIE DUMONT, '31  
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BUCHANAN, R. E., Ph.D., Research Professor and Head of Bacteriology.

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- SHEARER, P. S., M.S., Research Professor and Head of Animal Husbandry.
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- BROWN, P. E., Ph.D., Research Professor and Head of Soils.
- CANNON, C. Y., Ph.D., Research Professor and Head of Dairy Husbandry.
- CULBERTSON, C. C., Research Professor and Head of Animal Production, 1931, 1919.  
B.S., Iowa State College, 1918; M.S., *ibid.*, 1925.
- ERWIN, A. T., M.S., Research Professor and Head of Vegetable Crops.
- HELSEY, M. D., M.S., Research Professor and Head of Meats.
- HIXON, R. M., Ph.D., Research Professor and Head of Plant Chemistry.
- HUGHES, H. D., M.S.A., Research Professor and Head of Farm Crops.
- LUSH, J. L., Ph.D., Research Professor and Head of Animal Breeding.
- MANEY, T. J., Research Professor and Head of Pomology, 1917, 1912.  
B.S., Iowa State College, 1912.
- MORGAN, BARTON, Ph.D., Research Professor and Head of Rural Education.
- NELSON, P. MABEL, Ph.D., Research Professor and Head of Foods and Nutrition.
- PEET, LOUISE J., Ph.D., Research Professor and Head of Household Equipment.
- RATHBONE, ROSALIE, M.A., Research Professor and Head of Textiles and Clothing.
- SCHULTZ, T. W., Ph.D., Research Professor and Head of Agricultural Economics.



- THOMAS, B. H., Ph.D., Research Professor and Head of Animal Chemistry and Nutrition.
- VOLZ, E. C., M.S.A., Research Professor and Head of Floriculture.
- WILCKE, H. L., Ph.D., Research Professor and Head of Poultry Husbandry.

## RESEARCH PROFESSORS

- BAKKE, A. L., Ph.D., Botany and Plant Pathology.
- BERESFORD, REX, B.S., Co-operator, Agricultural Extension.
- BERGMAN, H. D., D.V.M., Co-operator, Veterinary Psychology.
- BUCHANAN, J. H., M.S., Co-operator, Chemistry.
- BURNETT, L. C., Farm Crops, 1932, 1911.  
B.S., University of Nebraska, 1903; M.S.A., Iowa State College, 1906.
- CAINE, A. B., M.S., Animal Production.
- COLLINS, E. V., Agricultural Engineering, 1932, 1914.  
B.S., in Agr. Engr., Iowa State College, 1914; B.S. in Agronomy, *ibid.*, 1914.
- COOVER, M. S., E.E., Co-operator, Electrical Engineering.
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- PICKETT, B. S., M.S., Pomology.
- RICHARDSON, C. H., Ph.D., Entomology and Economic Zoology.
- ROBOTKA, FRANK, Agricultural Economics, 1927, 1920.  
B.S., University of Wisconsin, 1915; M.S., University of Minnesota, 1921
- SHEARER, P. S., M.S., Animal Production.
- SWANSON, PEARL P., Ph.D., Foods and Nutrition.
- THOMPSON, S. H., Agricultural Economics, 1921, 1914.  
B.S., University of Minnesota, 1914; M.S., Iowa State College, 1923.
- WOODROW, J. W., Ph.D., LL.D., Co-operator, Physics.

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- BIRD, E. W., Ph.D., Dairy Industry.
- EDGAR, RACHEL, Ph.D., Textiles and Clothing.
- FERGUSON, FRED E., Associate Bulletin Editor, 1931, 1924.  
B.S., Iowa State College, 1922.
- FIRKINS, B. J., M.S., Soils.
- GAESSLER, W. G., Plant Chemistry, 1932, 1911.  
B.S., Ohio State University, 1911; M.S., *ibid.*, 1917.
- GILMAN, J. C., Ph.D., Co-operator, Botany.
- GOSS, E. F., M.S., Co-operator Dairy Industry.
- HABER, E. S., Ph.D., Vegetable Crops.
- HAMLIN, H. M., Ph.D., Rural Education.
- HANSEN, E. N., M.S., Dairy Husbandry.
- HOPKINS, J. A., Ph.D., Agricultural Economics.
- LOOMIS, W. E., Ph.D., Botany and Plant Pathology.
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- OHLSON, MARGARET A., Ph.D., Co-operator, Foods and Nutrition.
- PARK, O. W., Ph.D., Entomology and Economic Zoology.
- PORTER, R. H., Ph.D., Botany and Plant Pathology, Farm Crops.
- REDDY, C. S., Botany and Plant Pathology, 1932, 1927.  
B.S., University of Wisconsin, 1915; M.S., *ibid.*, 1916; Ph.D., *ibid.*, 1922.
- REID, MARGARET G., Ph.D., Agricultural Economics.
- SHEPHERD, G. S., Ph.D., Agricultural Economics.
- SMITH, ERMA A., A.B., M.A., Ph.D., M.D., Co-operator, Zoology.
- SMITH, F. B., Ph.D., Soils.
- THOMSON, R. B., M.F., Forestry.
- WAKELEY, R. E., Ph.D., Agricultural Economics.
- WENTZ, J. B., Ph.D., Farm Crops.
- WILSIE, C. P., Ph.D., Farm Crops.

## RESEARCH ASSISTANT PROFESSORS

- ANDERSON, C. ARNOLD, Ph.D., Rural Education.
- ARTHUR, I. W., Agricultural Economics, 1927, 1915.  
B.S., Iowa State College, 1916; M.S., *ibid.*, 1927.
- BEARD, F. J., M.S., Meats.
- BENTLEY, R. C., M.S., Agricultural Economics.

- BENTON, T. H., Soils, 1932, 1915.  
B.S., McKendrie College, 1912; B.S., Iowa State College, 1914; M.S., *ibid.*, 1915.
- BRANDT, A. E., Ph.D., Co-operator, Mathematics.
- DECKER, GEORGE C., Entomology and Economic Zoology, 1934, 1927.  
B.S., Iowa State College, 1924; M.S., *ibid.*, 1927; Ph.D., *ibid.*, 1930.
- ELDREDGE, J. C., Ph.D., Farm Crops.
- ENGLEHORN, A. J., Soils, 1930, 1925.  
B.S., South Dakota State College, 1923; M.S., Iowa State College, 1925.
- ERRINGTON, PAUL L., Entomology and Economic Zoology, 1932.  
B.S., South Dakota State College, 1930; Ph.D., University of Wisconsin, 1932.
- ESPE, D. L., Ph.D., Dairy Husbandry.
- FORMAN, L. W., Superintendent of Experiments in Soils, 1923, 1910..  
B.S., Iowa State College, 1909; M.S.A., *ibid.*, 1913.
- HAMMOND, W. E., Superintendent of Experiments in Animal Production, 1928, 1920.  
B.S., University of Minnesota, 1920; M.S., Iowa State College, 1921.
- HAYDEN, ADA, Ph.D., Botany and Plant Pathology.
- HENDRICKSON, G. O., Ph.D., Co-operator, Zoology.
- HOLBERT, J. C., M.S., Co-operator Animal Husbandry.
- HORN, SIDNEY, Staff Artist, Bulletin Office, 1936.
- KALAR, SARAH B., M.D., Co-operator Hygiene.
- KING, CHARLOTTE M., Botany and Plant Pathology.
- LANTZ, H. L., Pomology, 1928, 1916.  
B.S., Oregon State College, 1916; M.S., Iowa State College, 1918.
- LEE, C. D., D.V.M., M.S., Veterinary Investigations.
- MCCRACKEN, E. C., Ph.D., Co-operator, Physics.
- MELDRUM, H. R., Soils, 1932, 1926.  
B.S., Iowa State College, 1921.
- PLAGGE, H. H., Pomology, 1932, 1918.  
B.S., Iowa State College, 1916; M.S., *ibid.*, 1919; Ph.D., *ibid.*, 1932.
- RECK, S. H., JR., Assistant Bulletin Editor, 1936.  
B.S., Iowa State College, 1929.
- RICHARDS, L.A., Ph.D., Soils.
- ROBINSON, J. L., Farm Crops, 1932, 1920.  
B.S., Oklahoma Agricultural and Mechanical College, 1916; M.S., Iowa State College, 1918; Ph.D., *ibid.*, 1933.
- SASS, J. E., Ph.D., Co-operator, Botany.
- SCHICKELE, RAINER, Agricultural Economics.
- SCHULZ, J. A., Animal Chemistry and Nutrition, 1932, 1921.  
B.S., University of Illinois, 1917; M.S., Iowa State College, 1927.
- THORNE, D. W., Ph.D., (Acting) Soils.
- WATERS, N. F., D.Sc., Poultry Husbandry.
- WILCOX, WALTER W., M.S., Agricultural Economics.
- YODER, LESTER, Animal Chemistry and Nutrition, 1932, 1917.  
B.S.A., Purdue University, 1916; M.S., *ibid.*, 1917.

## RESEARCH ASSISTANTS

- ANDRE, FLOYD, Ph.D., Entomology and Economic Zoology.
- BARRE, HENRY J., Agricultural Engineering, 1931, 1930.  
B.S., Kansas State College, 1930; M.S., Iowa State College, 1933.
- BEESON, CLEADYTH, Agricultural Economics, 1934.  
A.B., Drake University, 1925.
- BREAZEALE, D. F., Dairy Industry, 1932, 1929.  
B.S., Iowa State College, 1928; M.S., *ibid.*, 1929.
- BUCHHOLTZ, W. F., Ph.D., Botany and Plant Pathology.
- BUCK, ROBERT K., B.S., Agricultural Economics.
- COX, GERTRUDE M., Statistics, 1933.  
B.S., Iowa State College, 1929; M.S., *ibid.*, 1931.
- DAVIS, GLEN N., Botany and Plant Pathology, 1930.  
B.S., Colorado Agricultural College, 1929; M.S., Iowa State College, 1930; Ph.D., *ibid.*, 1934.
- ECK, JOHN CLIFFORD, Animal Chemistry and Nutrition, 1935.  
B.S., Montana State College, 1931; M.S. University of Illinois, 1932; Ph.D., *ibid.*, 1935.
- ELKINGTON, CHAS. M., M.S., Agricultural Economics.
- ERICKSON, E. L., Farm Crops, 1934.  
B.S., Iowa State College, 1933.
- FABRICIUS, N. E., Ph.D., Co-operator, Dairy Industry.
- GOODSELL, WYLLIE D., Agricultural Economics, 1934.  
B.S., University of Idaho, 1934; M.S., *ibid.*, 1934.
- GULL, PROCTOR, Farm Crops, 1934.  
B.S., Iowa State College, 1933.
- GUNDERSON, HAROLD, M.S., Entomology and Economic Zoology.
- HANSBERRY, T. ROY, Entomology and Economic Zoology, 1934, 1933.  
B.S., State College of Washington, 1931; M.S., *ibid.*, 1932.
- HETZER, H. O., M.S., Ph.D., Genetics.
- HOOVER, C. DALE, Soils, 1935.  
A.B., Kansas State Teachers College, 1934; M.S., *ibid.*, 1935.
- HUTTON, M. ERNE-JEAN, Botany and Plant Pathology, 1935.  
B.S., South Dakota State College, 1933; M.S., Iowa State College, 1936.
- KENT, G. CLARENCE, Ph.D., Botany and Plant Pathology.
- JUDAY, CLARENCE B., Farm Crops, 1935.  
B.S. (E.E.), Purdue University, 1928; B.S.F., *ibid.*, 1935.
- LANE, C. B., Dairy Industry, 1934, 1931.  
B.S., Pennsylvania State College, 1929; M.S., Iowa State College, 1932; Ph.D., *ibid.*, 1934.
- LAYTON, D. V., Co-operator, Agricultural Extension.
- LONG, HENRY F., Dairy Industry, 1934.  
B.S., University of Maryland, 1931; M.S., Iowa State College, 1933; Ph.D., *ibid.*, 1936.
- MCCOMB, A. L., M.S., Co-operator, Forestry.
- MADDEN, FAITH M., Household Equipment, 1936.  
B.S., Nebraska Wesleyan, 1926; M.S., Iowa State College, 1936.
- MALONE, CARL, Agricultural Economics, 1930.  
B.S., Iowa State College, 1923.
- MICHAELIAN, M. B., Dairy Industry, 1932.  
B.S., Iowa State College, 1929; Ph.D., *ibid.*, 1931.

- MILBY, T. T., Ph.D., Poultry Husbandry.  
 MINGES, PHILIP A., Pomology, 1935.  
 B.S., Michigan State College, 1934.  
 MORGAN, N. D., Vegetable Crops, 1930.  
 B.S., University of Arkansas, 1930; M.S., Iowa State College, 1933.  
 NIELSEN, VERNER H., Co-operator, Dairy Industry.  
 QUINTUS, PAUL E., Ph.D., Agricultural Economics.  
 STEIN, HERBERT, B.A., Agricultural Economics.  
 STOUTEMYER, V. T., Pomology, 1930.  
 B.S., University of Illinois, 1928; M.S., Iowa State College, 1933.  
 SWINGLE, EDITH, Ph.D., Co-operator Bacteriology.  
 TATE, H. D., Entomology and Economic Zoology, 1936, 1931.  
 B.S., Mississippi A. & M., 1930; M.S., North Carolina College, 1931; Ph.D., Iowa State College, 1936.  
 WILLINGHAM, J. J., Dairy Industry, 1936.  
 B.S., Texas A. & M. College, 1931; M.S., Iowa State College, 1936.  
 WOOD, H. G., Bacteriology, 1936, 1931.  
 B.A., Macalester College, 1931; Ph.D., Iowa State College, 1934.

## RESEARCH GRADUATE ASSISTANTS

- BITTING, WAYNE, Agricultural Economics, 1935.  
 B.S., University of Illinois, 1933.  
 BRAUN, A. E., Botany and Plant Pathology, 1935.  
 B.S., University of Idaho, 1933; M.S., State College of Washington, 1935.  
 BRITTON, M. VIRGINIA, Agricultural Economics, 1936.  
 A.B., University of Akron, Ohio, 1936.  
 CRAVENS, WILLIAM W., Animal Chemistry and Nutrition, 1935.  
 B.S., University of Kentucky, 1935.  
 EICKELBERG, E. W., Chemistry, 1933.  
 B.S., Iowa State College, 1933; M.S., *ibid.*, 1935.  
 FARLEY, F. F., Plant Chemistry, 1936.  
 B.A., St. John's University, 1934; M.S., University of Detroit, 1936.  
 FOOTE, RICHARD J., Agricultural Economics, 1936.  
 B.S., Michigan State College, 1936.  
 FRUNDT, R. J. L., Animal Chemistry and Nutrition, 1936.  
 A.B., Hope College, 1934; M.S., Massachusetts State College, 1936.  
 GREEN, WILLIAM E., Entomology and Economic Zoology, 1935.  
 B.S., Colorado State College, 1935.  
 HARVEY, WILLIAM A., Botany and Plant Pathology, 1935.  
 A.B., University of Missouri, 1935.  
 KASLOW, H. D., Plant Chemistry, 1935.  
 B.S., North Dakota State College, 1934.  
 LINCOLN, RALPH, Genetics, 1936.  
 B.S., Iowa State College, 1934; M.S., Nebraska University, 1936.  
 MEREDITH, CLIFFORD, Botany and Plant Pathology, 1936, 1935.  
 B.S., Iowa State College, 1933; M.S., *ibid.*, 1936.  
 NAGEL, C. M., Botany and Plant Pathology, 1934, 1932.  
 B.S., North Dakota State College, 1929; M.S., Iowa State College, 1932.  
 SANDERS, EARL, Entomology and Economic Zoology, 1936.  
 A.B., Drury College, 1924; M.A., University of Michigan, 1934.  
 SELKO, LYLE, Entomology and Economic Zoology, 1936.  
 B.S., University of Nebraska, 1935; M.S., *ibid.*, 1936.

- VAN PEURSEM, RALPH L., Animal Chemistry and Nutrition, 1935.  
B.S., Iowa State College, 1928; A.B., Central College, 1929; M.S., Iowa State College, 1929.
- YOUNKIN, STUART G., Botany and Plant Pathology, 1935.  
B.S., Iowa State College, 1935.

## RESEARCH FELLOWS

- ANDERSEN, ARIEL A., B.S., M.S., Bacteriology, 1935.
- BARTLETT, JOHN B., A.B., M.S., Soils, 1936.
- BERNDS, MARIE W., B.S., Foods and Nutrition, 1936.
- BREWER, CARL R., A.B., Bacteriology, 1935.
- BRINKMAN, KENNETH A., B.S., Forestry, 1936.
- BUCHANAN, BEN F., A.B., Co-operator, Chemistry, 1934.
- CALDWELL, C. G., B.S., Plant Chemistry, 1936.
- CARMEN, GLEN E., B.S., Entomology and Economic Zoology, 1936.
- CLAYDON, THOMAS J., B.S., M.S., Dairy Industry, 1936.
- DEMORATSKY, B., B.S., Chemistry, 1936.
- DYME, H. C., B.S.A., Chemistry, 1935.
- ECKHARDT, ROBERT C., B.S., Farm Crops, 1936.
- FOWLES, RACHEL ANN, B.S., Foods and Nutrition, 1936.
- GROVE, LARRY C., B.S., M.S., Floriculture, 1933.
- HEPLER, TILLMAN M., B.S., Meats, 1936.
- HO, WEN CHEN, M.S., Botany and Plant Pathology, 1936.
- JONES, MAURINE, A.B., M.S., Textiles and Clothing, 1936.
- KELLOGG, WILBUR L., B.S., Genetics, 1936.
- LEONARD, OLIVER A., B.S., M.S., Botany and Plant Pathology, 1935.
- LICHTE, MINNIE, B.S., Textiles and Clothing, 1936.
- LINCOLN, JEANNETTE V., B.S., Household Equipment, 1936.
- MARTIN, WM. P., A.B., M.S., Soils, 1934.
- MEUWISSEN, GALEN H., B.S., M.S., Dairy Industry, 1935.
- MILIUS, HANS C., B.S., Forestry, 1936.
- PEACH, C. E., B.S., Agricultural Engineering, 1936.
- PEEVY, WALTER J., B.S., Soils, 1936.
- RUSSELL, J. ARIE, B.S.A., Soils, 1936.
- RUSSELL, MORRELL B., B.S., Soils, 1936.
- SEATH, DWIGHT M., B.S., M.S., Animal Breeding, 1936.
- SEMENIUK, GEORGE B. S., M.Sc., Botany and Plant Pathology, 1934.
- SCHAEFFER, FLORENCE L., B.S., Household Equipment, 1936.
- TEST, WM. DEAN, B.S., Agricultural Engineering, 1936.
- UNDERBJERG, GRAVERS K. L., Dairy Husbandry, 1935.
- WARD, CLIFTON A., B.S., Dairy Husbandry, 1936.
- WHATLEY, J. ARNOLD, JR., B.S., Animal Breeding, 1936.
- WHISLER, PAUL A., B.S., Agricultural Engineering, 1936.

- WILCOX, ETHELWYN B., B. S., Foods and Nutrition, 1936.  
 WILLIAMS, JAMES K., B.S., Poultry Husbandry, 1936.  
 WILLIAMS, NIEL K., B.S.A., Dairy Husbandry, 1935.  
 WILSON, HAROLD A., B.S., M.S., Soils, 1935.

### RESIDENT COLLABORATORS

- BENNETT, LOGAN J., B.S., M.S., Bureau of Biological Survey, U.S.D.A.  
 BOATMAN, J. L., B.S., M.S., State Co-ordinator, Soil Conservation Service, U.S.D.A.  
 BROWN, E. O., B.S., M.S., Bureau of Plant Industry, U.S.D.A.  
 BRYAN, A. A., B.S., M.S., Ph.D., Bureau of Plant Industry, U.S.D.A.  
 DODGE, ALBERT F., B.S., M.S., Soil Conservation Service, U.S.D.A.  
 HOYMAN, W. G., B.S., M.S., Bureau of Plant Industry, U.S.D.A.  
 JEZEK, R. E., B.S., Bureau of Agricultural Engineering, U.S.D.A.  
 JUGENHEIMER, R. W., B.S., M.S., Bureau of Plant Industry, U.S.D.A.  
 LUBBERTS, D. R., B.S., Bureau of Plant Industry, U.S.D.A.  
 MURPHY, H. C., B.S., M.S., Ph.D., Bureau of Plant Industry, U.S.D.A.  
 RHOADES, M. M., B.S., M.S., Ph.D., Bureau of Plant Industry, U.S.D.A.  
 SHEDD, C. K., B.S.A., B.S. (A.E.), Bureau of Agricultural Engineering, U.S.D.A.  
 SHEPHERD, D. R., B.S., Bureau of Plant Industry, U.S.D.A.  
 WEISS, MARTIN, B.S., M.S., Bureau of Plant Industry, U.S.D.A.

### ENGINEERING EXPERIMENT STATION

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 KIMBALL, ALLEN H., M.S. . . . . Architectural Engineering  
 COX, PAUL E., B.S. (Cer.E.), Sc.D. . . . . Ceramic Engineering  
 SWEENEY, ORLAND R., Ph.D. . . . . Chemical and Mining Engineering  
 FULLER, ALMON H., C.E., D.Engr. . . . . Civil Engineering  
 COOVER, MERVIN S., E.E. . . . . Electrical Engineering  
 FULLER, GEORGE M., M.B.A. . . . . Industrial Economics  
 FABER, DANIEL C., E.E. . . . . Engineering Extension  
 PAINE, FRANK D., B.S. (E.E.) . . . . . General Engineering  
 HUNTER, WILLIAM L., M.A. . . . . Industrial Arts  
 CLEGHORN, MARK P., B.S. (E.E.), M.E. . . . . Mechanical Engineering  
 GILKEY, HERBERT J., M.S. . . . . Theoretical & Applied Mechanics

\*In those cases where data relative to date of appointment and scholastic preparation are not given in the following list, the information will be found in the "Officers of Instruction" roster beginning on page 14.

## RESEARCH STAFF

## RESEARCH ENGINEERS

- CLEGHORN, MARK P., B.S. (E.E.), M.E. . . . Mechanical Engineering  
 COX, PAUL E., B.S. (Cer.E.), Sc.D. . . . . Ceramics  
 FULLER, GEORGE M., M.B.A. . . . . Industrial Economics  
 GILKEY, HERBERT J., M.S. . . . . Theoretical & Applied Mechanics  
 GRIFFITH, JOHN H. . . . . Engineering Materials, 1934, 1919  
     B.S. (C.E.), University of Wisconsin, 1893; M.S. (Math.), *ibid.*, 1897.  
 COOVER, MERVIN S., E.E. . . . . Electrical Engineering  
 HOLL, DIO L., Ph.D. . . . . Mathematics  
 LEVINE, MAX, Ph.D. . . . . Sanitary Bacteriology  
 MARSTON, ANSON, C.E., D.Engr. . . . . Civil Engineering  
 SCHLICK, WILLIAM J. . . . . Drainage Engineering, 1914  
     B.C.E., Iowa State College, 1909; C.E., *ibid.*, 1914.  
 SWEENEY, ORLAND R., Ph.D. . . . . Chemical Engineering  
 WINFREY, ROBLEY . Valuation and Cost Analysis, Bulletin Editor, 1922  
     B.S. (C.E.), Iowa State College, 1922; M.S., *ibid.*, 1926.

## ASSOCIATE ENGINEERS

- ARNOLD, LIONEL K. . . . . Chemical Engineering, 1933, 1925  
     A.B., Ellsworth College, 1920; B.S., Iowa State College, 1921; M.S., *ibid.*,  
     1926; Ph.D., *ibid.*, 1930.  
 AYRES, QUINCY C., B.S., B.E., C.E. . . . Agricultural Engineering  
 DUNAGAN, WALTER M., M.S., C.E. . . . . Concrete Materials  
 MOYER, RALPH A., M.S., C.E. . . . . Highway Engineering  
 SPANGLER, MERLIN G. . . . . Structural Engineering, 1929, 1924  
     B.S. (C.E.), Iowa State College, 1919; C.E., *ibid.*, 1926; M.S., *ibid.*, 1928.  
 DAASCH, HARRY L., M.S. . . . . Mechanical Engineering  
 HEMPSTEAD, J. C., M.A. . . . . Valuation Engineering

## ASSISTANT ENGINEERS

- BROWN, ORAL A., Ph. D. . . . . Electrical Engineering  
 GALLIGAN, WILLIAM E., M.S. . . . . Sanitary Engineering  
 HESSLER, VICTOR P., Ph.D. . . . . Electrical Engineering  
 LIGHTBURN, FRANK E., M.S. . . . . Structural Engineering  
 MURPHY, GLENN, Ph.D. . . . . Engineering Materials  
 NELSON, GUSSIE H. . . . . Sanitary Chemistry, 1929  
     Agricultural By-Products Co-operative Research.  
     B.S. (Chem.E.), University of Iowa, 1923; M.S. (Chem.E.), *ibid.*, 1924.  
 PAUSTIAN, RAYMOND G., M.S. . . . . Highway Engineering

## JUNIOR ENGINEERS

- DACHTLER, W. C., B.S. (G.E.) . . . . . Industrial Economics



- McELHINNEY, THOMAS ROBERT . . . . . Chemical Engineering, 1935  
 Agricultural By-Products Co-operative Research.  
 B.S. (Chem.E.), Iowa State College, 1931.
- HELFINSTINE, R. J. . . . . Mechanical Engineering  
 B.S. (Mech.E.), Iowa State College, 1934.
- HODGDON, FRANK B. . . . . Ceramic Engineering  
 B.S., (Cer.E.), Iowa State College, 1930; S.M. (Chem.E.), Massachusetts  
 Institute of Technology, 1932.
- CHAMBERLIN, STEPHEN J., M.S. . . . . Engineering Materials
- KALSEM, PALMER . . . . . Asst. Bulletin Editor, 1936.

### RESEARCH GRADUATE ASSISTANTS

- ROLLMAN, WALTER F., B.S. (Chem.E.), M.S. Chemical Engineering, 1934
- HITCHCOCK, WILBUR, B.S. (C.E.) . . . . . Civil Engineering, 1935
- JOHNSTON, JAMES ALVIN, B.S. (Chem.E.) . Chemical Engineering, 1935
- GRAY, WALTER, B.S. (C.E.) . . . . . Civil Engineering, 1936
- COBLENTZ, JACOB, B.S. . . . . Sanitary Bacteriology, 1934
- NEWBURY, ALLEN H. (M.E.) . . . . . Mechanical Engineering, 1935

### MECHANICIAN

- RIEDELSEL, REUBEN C. . . . . Research Apparatus, 1912  
 B.S. (M.E.), Iowa State College, 1909.

### AGRICULTURAL BY-PRODUCTS LABORATORY OF THE BUREAU OF CHEMISTRY AND SOILS OF THE U. S. DEPARTMENT OF AGRICULTURE ADVISORY BOARD

- KNIGHT, HENRY G., M.A., Ph.D., Chief of Bureau, U.S.D.A.
- SKINNER, W. W., M.S., Sc.D., Assistant Chief of Bureau, U.S.D.A.
- HERRICK, H. T., M.S., Ch.E., Chief, Industrial Farm Products Research  
 Division, U.S.D.A.
- LYNCH, D. F., M.A. (Chem.), B.A. (Chem.), LL.B. (Law), LL.M. (Law),  
 Chief of Ames Field Station Laboratory.
- AGG, THOMAS R., B.S., C.E., Director of Iowa Engineering Experiment  
 Station and Chief, College Representative.
- BUCHANAN, R. E., Ph.D., Dean of Graduate College and Director of Agri-  
 cultural Experiment Station, Iowa State College.
- FRILEY, CHARLES E., M.A., LL.D., President of Iowa State College.
- SWEENEY, ORLAND R., Ph.D., Head of Department of Chemical Engineer-  
 ing, Iowa State College.

### RESEARCH STAFF

- LYNCH, D. F., M.A. (Chem.), B.A. (Chem.), LL.B. (Law), LL.M. (Law),  
 Senior Chemical Engineer in Charge.
- STRAKA, ROBERT P., M.S., Assistant Bacteriologist.
- WHITTEMORE, EDWARD R., Ph.D., Assistant Paper Technologist.

WEIHE, HERMAN DELIUS, M.S., Assistant Chemist.  
NELSON, GUSSIE HARRIE, JR., M.S., Co-operator (Asst. Chem. Engr.)  
McELHINNEY, THOMAS ROBERT, B.S., Co-operator (Junior Chemical Engineer.)

CONSULTANTS

SWEENEY, ORLAND R., Ph.D., Chemical Engineering.  
LEVINE, MAX, Ph.D., Bacteriology.  
GALLIGAN, WILLIAM E., M.S., Sanitary Engineering.

INDUSTRIAL SCIENCE RESEARCH\*

FRILEY, CHARLES E., A.M., LL.D. . . . . Director

RESEARCH PROFESSORS

BECKER, ELERY R., D.Sc. . . . . Zoology  
FULMER, ELLIS I., Ph.D. . . . . Chemistry  
GILMAN, HENRY, Ph.D. . . . . Chemistry  
HIXON, RALPH M., Ph.D. . . . . Chemistry  
HOLL, DIO L., Ph.D. . . . . Mathematics  
WERKMAN, CHESTER H., Ph.D. . . . . Bacteriology

RESEARCH ASSOCIATE PROFESSORS

CARR, PERCY H., Ph.D. . . . . Physics  
LAUER, ALVHH R., Ph.D. . . . . Psychology

RESEARCH ASSISTANT PROFESSORS

HENDRICKSON, GEORGE, Ph.D. . . . . Zoology  
McCracken, EARL C., Ph.D. . . . . Physics  
WAKELEY, RAY E., Ph.D. . . . . Economics

RESEARCH ASSISTANTS

ARNOLD, C. RICHARD, M.S. . . . . Bacteriology, 1936  
SOOTER, CLARENCE, M.S. . . . . Zoology, 1936  
UNDERKOFER, LELAND A., Ph.D. . . . . Chemistry, 1935

RESEARCH FELLOWS

BEBB, ROBERT L., B.A. . . . . Chemistry, 1934  
BURRIS, ALBERT, M.S. . . . . Physics, 1934

\*In those cases where data relative to date of appointment and scholastic preparation are not given in the following list, the information will be found in the "Officers of Instruction" roster beginning on page 14.

BEE, LAWRENCE, A.B. . . . .	Sociology, 1936
CLAUS, WILBUR S., M.S. . . . .	Chemistry, 1934
DERBYSHIRE, RUSSELL C., M.S. . . . .	Zoology, 1936
DUNNING, JOHN W., B.S. . . . .	Chemistry, 1935
DYKSTRA, KENNETH, B.A. . . . .	Chemistry, 1934
FORD, BRUCE R., B.S. . . . .	Bacteriology, 1936
GUYMOND, JAMES F., B.S. . . . .	Chemistry, 1935
JACOBY, A. L., B.S. . . . .	Chemistry, 1936
KIRCHNER, J. G., M.S. . . . .	Chemistry, 1935
MICKELSON, MILO N., B.S. . . . .	Bacteriology, 1935
MOREHOUSE, NEAL E., M.S. . . . .	Zoology, 1934
MORGAL, PAUL W., M.S. . . . .	Chemistry, 1935
MOUDEN, HOMER, A.B. . . . .	Physics, 1936
NELSON, JOSEPH F., M.A. . . . .	Chemistry, 1934
NEWTON, MARSHALL, B.S. . . . .	Chemistry, 1936
PARKER, PAUL T., B.S. . . . .	Chemistry, 1933
ROCK, DON H., B.A. . . . .	Mathematics, 1936
SALATHIEL, RICHARD, M.S. . . . .	Chemistry, 1935
SCHOENE, LORIN, A.B. . . . .	Chemistry, 1936
SEIFERLE, E. J., B.S. . . . .	Chemistry, 1936
STAUSS, JAMES H., A.B. . . . .	Economics, 1936
WENDLAND, RAY, B.A. . . . .	Chemistry, 1933
WIGGERT, WILBUR, B.S. . . . .	Bacteriology, 1936

## RESEARCH SCHOLARS

BRADLEY, CHESTER W., M.S. . . . .	Chemistry, 1935
CHENEY, L. C., M.A. . . . .	Chemistry, 1936
CHANG, KWEI, M.S. . . . .	Zoology, 1936
OLDHAM, WILBUR, M.S. . . . .	Chemistry, 1936

## STATISTICAL LABORATORY

SNEDECOR, GEORGE W., M.A. . . . .	Director, Research Professor, 1933, 1913
BRANDT, A. E., Ph.D. . . . .	Research Assistant Professor, 1933, 1924
COX, GERTRUDE M., M.S. . . . .	Research Assistant, 1933

## VETERINARY RESEARCH\*

## RESEARCH COUNCIL

MURRAY, CHARLES, Pe.B., B.S., D.V.M. . . . .	Director
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\*In those cases where data relative to date of appointment and scholastic preparation are not given in the following list, the information will be found in "Officers of Instruction" roster beginning on page 14.

BERGMAN, H. D., D.V.M. . . . .	Professor, Physiology
BENBROOK, E. A., V.M.D. . . . .	Professor, Pathology
COVAULT, C. H., D.V.M. . . . .	Professor, Medicine
FOUST, H. L., D.V.M. . . . .	Professor, Anatomy
FOWLER, G. R., D.V.M. . . . .	Professor, Surgery
WALSH, F. E., D.V.M. . . . .	Professor, Obstetrics

## ASSOCIATES

- BIESTER, HARRY E., Associate Professor, Research, 1927, 1920.  
V.M.D., University of Pennsylvania, 1919.
- McNUTT, SAMUEL H., Associate Professor, Research, 1927, 1917.  
D.V.M., Iowa State College, 1917.
- SCHWARTE, LOUIS H., Associate Professor, Research, 1935, 1925.  
B.S., Cornell University, 1918 M.S., *ibid.*, 1920; D.V.M. Iowa State College, 1928; Ph.D., *ibid.*, 1934.
- EVELETH, DONALD FRANCIS, Associate Professor, Research, 1934, 1932.  
B.S., University of California, 1928; M.A., *ibid.*, 1930; Ph.D., Western Reserve Medical College, 1932; D.V.M., Iowa State College, 1934
- LEE, CHESTER D., Assistant Professor, Research, 1933, 1927.  
D.V.M., Iowa State College, 1927; M.S., *ibid.*, 1932.

# Extension

## EXTENSION IN AGRICULTURE AND HOME ECONOMICS

- BLISS, R. K. . . . . Director, 1914, 1906  
B.S.A., Iowa State College, 1905.
- TAFF, P. C. . . . . Assistant Director, 1917, 1912  
B.S. (Agron.), Iowa State College, 1913.
- MCDONALD, MURL . . . . . Assistant Director, 1918, 1911  
B.S.A. Iowa State College, 1911.
- HARPER, W. L. . . . . Secretary, 1920, 1911

## STAFF

- ADAMS, GLADYS . Extension Instructor of Home Economics, 1935, 1929  
B.S., Iowa State College, 1928.
- ALLBAUGH, L. G., Ext. Assoc. Professor of Farm Management, 1922, 1918  
B.S. (F.M.), Iowa State College, 1919; M.S., *ibid.*, 1928.
- ANDERSON, MAE . Extension Instructor of Home Economics, 1935, 1930  
B.S., Iowa State College, 1930.
- ARNOLD, FLOYD J. . . . . Ext. Asst. in Dairy Husbandry, 1927  
B.S., Iowa State College, 1926
- ARTHUR, I. W. . . . Ext. Asst. Professor of Marketing, 1927, 1915  
B.S. (A.H.), Iowa State College, 1916; M.S., *ibid.*, 1927.
- BEATY, HAROLD H. . . . Ext. Asst. in Agricultural Engineering, 1936  
B.S., Iowa State College, 1931
- BARKER, MRS. EDITH . . . . . Agent in Club Work, 1923, 1917
- BENTLEY, R. C. . . . Ext. Asst. Professor of Marketing, 1934, 1928  
B.S., North Dakota Agricultural College, 1923; M.S., *ibid.*, 1924.
- BERESFORD, REX . . . . Ext. Professor of Animal Husbandry, 1916  
B.S. (A.H.), Iowa State College, 1911.
- \*BOATMAN, J. L. . . . . Ext. Professor of Soils, 1925, 1921  
B.S., Iowa State College, 1921.
- BOUSKA, FRANK J. . . . . Ext. Asst. in Dairy Industries, 1935  
B.S., Iowa State College, 1934.
- \*CADY, E. L. . . . . Ext. Asst. Professor of Marketing, 1929, 1922  
B.S. (Ag.), University of Missouri, 1921; M.S., Iowa State College, 1923;  
Ph.D., *ibid.*, 1933.
- CESSNA, RUTH . . Ext. Asst. Professor of Home Economics, 1924, 1917  
B.S., Iowa State College, 1914; M.A., Columbia University, 1917.
- CHAPMAN, GRANT . . . . . Supt. of Tours, 1923, 1917

\*Absent on leave.

- CHENEY, HORACE B. . . . . Ext. Asst. in Agronomy, 1937  
B.S., Iowa State College, 1935.
- CLARK, FRED . . . . . District Extension Agent, 1928, 1916  
B.S. (A.H.), Iowa State College, 1916.
- CROMER, PAUL . . . . . Ext. Asst. in Dairy Industries, 1934, 1933  
B.S., Iowa State College, 1920.
- COMBS, L. R. . . . . Extension Editor, 1929, 1928  
B.S. (Ind. Journ.), Kansas State College, 1926.
- COWDEN, J. M. . . . . Ext. Asst. Professor of Marketing, 1927  
B.S., Iowa State College, 1925.
- DAVIS, GLEN N. . . . . Ext. Asst. Professor of Plant Diseases, 1934, 1929  
B.S., Colorado Agricultural College, 1929; M.S., Iowa State College, 1930;  
Ph.D., *ibid.*, 1934.
- DECKER, GEO. C. . . . . Ext. Instructor, Injurious Insects, 1934, 1927  
B.S., Iowa State College, 1924; M.S., *ibid.*, 1927; Ph.D., *ibid.*, 1930.
- DIEKEN, GERTRUDE . . . . . Asst. Extension Editor, 1934  
Coe College, 1932
- DILWORTH, DON . . . . . Asst. Extension Editor, 1937  
B.S., Iowa State College, 1934.
- DYAS, E. S. . . . . Ext. Asst. Professor of Farm Crops and Soils, 1923, 1916  
B.S. Iowa State College, 1920.
- EAGER, ZANETA . . . . . Rural Organization Specialist, 1934  
B.A., Pomona College, 1921
- EDGECOMBE, S. W. . . . . Ext. Asst. Professor of Horticulture, 1935  
B.S.A., University of Manitoba, 1930; M.S., Iowa State College, 1931; Ph.D.,  
*ibid.*, 1936.
- EICHLING, H. L. . . . . District Extension Agent, 1922, 1911  
B.S., Iowa State College, 1911.
- ELLIS, MRS. SARAH PORTER . . . . . Ext. Professor of Home Economics, 1934  
B.S., University of Wisconsin, 1916.
- ERICKSON, ELMER . . . . . Seed Analyst, 1934  
B.S., Iowa State College, 1934.
- FISH, DONALD . . . . . Ext. Asst. in Farm Management, 1935, 1934  
B.A., University of Minnesota, 1932.
- FITCH, C. L. . . . . Ext. Professor of Vegetables, 1913  
M.A., Grinnell College, 1913.
- FITZIMMONS, J. R. . . . . Ext. Professor of Landscape Architecture, 1924  
B.S., Colorado Agricultural College, 1921; M.L.A. Harvard University, 1924.
- FOLKEN, HERBERT . . . . . Ext. Asst. in Farm Management, 1935  
B.S., Iowa State College, 1931.
- FORBES, FLORENCE . . . . . Agent in Club Work, 1926, 1923  
B.S., Iowa State College, 1925.
- GALLOWAY, J. C. . . . . Ext. Assoc. Professor of Farm Management, 1918  
B.S. (A.H.), Iowa State College, 1916.
- GANNON, FANNIE . . . . . Ext. Instructor of Home Economics, 1926, 1919  
B.S., Iowa State College, 1921.
- GARNER, IRMA . . . . . Ext. Instructor of Home Economics, 1928  
B.S., Iowa State College. 1926; M.S., *ibid.*, 1928.

- GRAFF, E. F. . . . . District Extension Agent, 1920, 1917  
B.S., Iowa State College, 1917.
- GREGG, MRS. MARY . Ext. Asst. Professor of Home Economics, 1926, 1917
- GRIFFITH, W. I. . . . Ext. Asst. Professor of Visual Instruction, 1925  
B.S., Iowa State College, 1899.
- GUNDERSON, HAROLD . . . . . Asst. Extension Entomologist, 1937  
B.S., Montana State College, 1934; M.S., *ibid.*, 1935.
- HAMILTON, CARL . . . . . Asst. Extension Editor, 1936, 1934 .  
B.S., Iowa State College, 1936.
- HANSBERRY, T. ROY . . . Ext. Instructor, Injurious Insects, 1934, 1933  
B.S., Washington State College, 1931; M.S., *ibid.*, 1932.
- HAUSER, M. A. . . . Ext. Professor of Farm Crops and Soils, 1916, 1906
- HOLSINGER, C. V. . . . . Ext. Professor of Horticulture, 1918  
B.S., Kansas State College, 1895.
- HUTTON, MARY-ERNE-JEAN Seed Laboratory Asst. & Research Asst., 1936  
B.S., South Dakota State Colltge, 1933; M.S., Iowa State College, 1936.
- JOHNSON, RUSSELL . . . Ext. Asst. in Landscape Architecture, 1935  
B.S.L.A., Iowa State College 1925.
- JOHNSTON, FLOYD . . . Ext. Assoc. Professor of Dairy Husbandry, 1928  
B.S., Iowa State College, 1924.
- JONES, MRS. ALMA . Ext. Asst. Professor of Home Economics, 1925, 1922  
B.S., Iowa State College, 1922; M.S., Columbia University, 1925.
- KILPATRICK, BRUCE . . . . . Ext. Asst. in Agronomy, 1936, 1933  
B.S., Iowa State College, 1932.
- KNOWLES, NEALE S. . . . . Ext. Professor of Home Economics, 1907
- KOOSER, HAROLD . . . . . Ext. Asst. Visual Instruction, 1924  
B.S., Iowa State College, 1923.
- LARSON, MRS. N. MAY Ext. Asst. Professor of Home Economics, 1929, 1918  
B.S., University of Wisconsin, 1917.
- LAYTON, DUKE V. . . . Ext. Instructor of Plant Diseases, 1931, 1927  
B.S., New Mexico Agricultural College, 1926; M.S., Iowa State College, 1929.
- LOUGHRAN, ELLA . . . . . Agent in Club Work, 1936, 1927  
B.S., Iowa State College, 1921.
- MCDONALD, C. W. . Ext. Assoc. Professor of Animal Husbandry, 1919  
B.S., Pennsylvania State College, 1917; M.S., *ibid.*, 1919.
- MAAKESTAD, W. T. . . . . Ext. Asst. in Marketing, 1936, 1926  
B.S. (Agron.), Iowa State College, 1916; B.S., (Ag. Ed.), 1918.
- \*MACY, L. K. . . . . Ext. Asst. in Farm Management, 1935, 1931  
B.S., Iowa State College, 1929.
- MERRILL, J. W. . . . . District Extension Agent, 1924, 1909  
B.S.A., Iowa State College, 1909.
- MORGAN, BARTON . . . . . Ext. Prof. of Vocational Education, 1936  
B.S., Missouri State Teachers, 1919; M.S., Iowa State College, 1922; Ph.D.,  
State University of Iowa, 1934.
- MORRIS, N. A. . . . Ext. Asst. Professor of Landscape Architecture, 1934  
B.S., Iowa State College, 1930.

- NUTTY, LEE T. . . . . District Extension Agent, 1929, 1917  
B.S., (A.H.), Iowa State College, 1917.
- ODERKIRK, ALVIN . . . . . Ext. Asst. Prof. in Ag. Ec. (poultry), 1936  
B.S., North Dakota State, 1926; M.S., Iowa State College, 1928.
- PADDOCK, F. B. . . . . State Apiarist, 1919  
B.S., Colorado Agricultural College, 1911; M.S., Ohio State University, 1915.
- PETERSEN, ANNETTE . . . . . Ext. Instructor of Home Economics, 1930  
B.S., Iowa State College, 1930.
- PETERSON, ELIZABETH . . . . . Ext. Instructor of Home Economics, 1935, 1928  
B.S., Iowa State College, 1925.
- PORTER, ARTHUR . . . . . Extension Asst. Dairyman, 1935  
B.S., Iowa State College, 1931.
- PORTER, R. H. . . . . Ext. Professor of Plant Pathology, 1931, 1919  
B.S., Iowa State College, 1918; M.S., *ibid.*, 1920; Ph.D., *ibid.*, 1930.
- QUAIFE, E. L. . . . . Ext. Assoc. Professor of Animal Husbandry, 1917  
B.S., Iowa State College, 1911.
- QUIST, J. S. . . . . Agent in Club Work, 1921, 1918  
B. S., Iowa State College, 1917
- RAMSEY, G. R. . . . . Ext. Asst. Professor of Forestry, 1934  
B.S., University of Washington, 1929; M.S., *ibid.*, 1931.
- RECK, SAM JR. . . . . Asst. Extension Editor, 1936  
B.S., Iowa State College, 1929.
- REED, FRANK P. . . . . Agent in Club Work, 1917, 1911  
LL.B., Drake University, 1896.
- ROBINSON, JOE L. . . . . Ext. Assoc. Professor of Soils, 1934, 1920  
B.S., Oklahoma Agricultural and Mechanical College, 1916; M.S., Iowa State College, 1918; Ph.D., *ibid.*, 1933.
- ROBOTKA, FRANK . . . . . Ext. Assoc. Professor of Marketing, 1927, 1920  
B.S., University of Wisconsin, 1915; M.S., University of Minnesota, 1921.
- RUDNICK, A. W. . . . . Ext. Professor of Dairy Industries, 1918, 1913  
B.S., Iowa State College, 1910.
- SCOTT, THOMAS J. . . . . Wildlife Specialist, 1935  
B.S., Iowa State College, 1935.
- SHIPTON, HOWARD . . . . . Instructor of Apiary Work, 1926
- SHULTZ, E. N. Asst. Prof. in Charge Rural Young Peoples Work, 1935,  
1926.  
B.S., Iowa State College, 1924; M.S., University of Minnesota, 1929.
- SIMPSON, RUBY . . . . . Ext. Instructor of Home Economics, 1935  
B.S., Nebraska University, 1924; M.S., Iowa State College, 1930.
- SIMMONS, DOROTHY . . . . . Ext. Instructor of Home Economics, 1935, 1934  
B.S., Iowa State College, 1931.
- \*SOTH, LAUREN . . . . . Ext. Instructor of Farm Management, 1934, 1932  
B.S., Iowa State College, 1932.
- STACY, W. H. . . . . Ext. Assoc. Professor of Rural Organization, 1922, 1917  
B.S., Iowa State College, 1917; M.S., Cornell University, 1922.
- STOUDER, K. W. . . . . Ext. Professor of Veterinary Medicine, 1913  
D.V.M., Iowa State College, 1905.
- SWINNEY, HELEN . . . . . Ext. Instructor of Home Economics, 1929  
B.S., Iowa State College, 1927.



- SYLWESTER, ERHARDT** . . Ext. Asst. in Plant Pathology & Botany, 1935  
B.A., St. Olaf College, 1930; M.S., Iowa State College, 1931.
- THOMPSON, SAM H.** . . . . Ext. Professor of Marketing, 1921, 1914  
B.S., University of Minnesota, 1914; M.S., Iowa State College, 1923.
- VERNON, WM. M.** . . . . Ext. Assoc. Professor of Poultry, 1928, 1920  
B.S., North Carolina State College, 1919; M.S., Iowa State College, 1923.
- VIRTUE, BYRON.** Ext. Instructor of Agricultural Engineering, 1933, 1931  
B.S., Iowa State College, 1931; M.S., *ibid.*, 1932.
- VAN VLACK, C. H.** Ext. Assoc. Prof. of Agricultural Engineering, 1934  
B.S., Iowa State College, 1929.
- WAKELEY, RAY E.** . Ext. Asst. Professor of Rural Sociology, 1934, 1930  
B.S., Pennsylvania State College, 1917; M.S., University of Wisconsin, 1924;  
Ph.D., Cornell University, 1928.
- WATKINS, W. F.** . . . . Ext. Assoc. Professor of Agronomy, 1936, 1926  
B.S., Iowa State College, 1926; M.S. *ibid.*, 1933.
- WEAVER, RUSSELL** . . . . Ext. Asst. in Dairy Industries, 1932  
B.S., Iowa State College, 1930.
- WESTER, KARL** . . . . . Ext. Asst. in Dairy Industries, 1932  
B.S., Iowa State College, 1930.
- WHITFIELD, W. R.** . . . . Ext. Asst. in Poultry Husbandry, 1927  
B.S., University of Nebraska, 1926.
- WINGERT, JOHN** . . . . . Asst. in Horticulture, 1936  
B.S., Iowa State College, 1930.
- WILSON, ALEENE** . . . . . Ext. Asst. of Home Economics, 1936, 1935  
B.S., Iowa State College, 1929.
- WILSON, L. MILDRED** . . . Ext. Instructor of Home Economics, 1925  
B.S., Iowa State College, 1924.
- WOOD, MARY** . . . . . Ext. Clothing Specialist, 1936  
B.S., Iowa State College, 1935.
- WOODRUFF, J. A.** . . Ext. Instructor of Agricultural Education, 1927  
B.Di., Iowa State Teachers College, 1901; M.Di., *ibid.*, 1904; B.S., Iowa State  
College, 1933.
- WOOLFRIES, ANDY** . . . . . Radio Announcer, 1921
- WORKMAN, NORA** . Ext. Asst. Professor of Home Economics, 1925, 1918  
B.S., Iowa State College, 1916.
- WORTHINGTON, A. D.** . Ext. Asst. Professor, Injurious Insects, 1932, 1921  
B.S., Mississippi State College, 1927

## COUNTY AGENTS

- ZELLERS, WALTER M.** . . . . . Adair, Greenfield  
B.S., Iowa State College, 1929.
- SPARBOE, WM. H.** . . . . . Adams, Corning  
B.S., Iowa State College, 1929.
- O'RILEY, FRED C.** . . . . . Allamakee, Waukon  
B.S., Iowa State College, 1926.
- BOWDISH, LEO** . . . . . Appanoose, Centerville  
B.S., Iowa State College, 1929.
- MCGINNIS, E. M.** . . . . . Audubon, Audubon

GREEN, JAMES C. . . . .	Benton, Vinton
B.S., Iowa State College, 1923.	
BARGER, PAUL . . . . .	Black Hawk, Waterloo
B.S., Iowa State College, 1926.	
WALKER, HARLEY . . . . .	Boone, Boone
B.S., Iowa State College, 1914.	
OFFRINGA, D. D. . . . .	Bremer, Waverly
B.S., Iowa State College, 1922.	
WESTERN, D. E. . . . .	Buchanan, Independence
B.S., Iowa State College, 1929.	
GUNNERSON, G. L. . . . .	Buena Vista, Storm Lake
B.S., Iowa State College, 1917.	
VAN WERT, J. S. . . . .	Butler, Allison
B.S., Iowa State College, 1933.	
DARBYSHIRE, WM. . . . .	Calhoun, Rockwell City
B.S., Iowa State College, 1928.	
KLOSER, FRANCIS J. . . . .	Carroll, Carroll
B.S., Iowa State College, 1918.	
KNAUPP, PAUL . . . . .	Cass, Atlantic
B.S., Iowa State College, 1933.	
SEEDS, MORRELL . . . . .	Cedar, Tipton
B.S., Iowa State College, 1921.	
OLSON, M. E. . . . .	Cerro Gordo, Mason City
B.S., (Agron.), Iowa State College, 1914.	
THOMPSON, CLARENCE . . . . .	Cherokee, Cherokee
B.S., I.S.C., 1928.	
THUROW, MELVIN . . . . .	Chickasaw, New Hampton
B.S., Iowa State College, 1931.	
WHIRRETT, KENNETH . . . . .	Clarke, Osceola
B.S., Iowa State College, 1921.	
BUSENBARK, PAUL . . . . .	Clay, Spencer
B.S., Iowa State College, 1917.	
COMBS, A. R. . . . .	Clayton, Elkader
B.S., Iowa State College, 1915.	
LACY, MYRON D. . . . .	Clinton, DeWitt
B.S., Texas Agricultural and Mechanical College, 1930; M.S., Iowa State College, 1931.	
JOHNSON, PAUL A. . . . .	Crawford, Denison
B.S., Iowa State College, 1913.	
BEVING, JOE T. . . . .	Dallas, Adel
B.S., Iowa State College, 1935.	
OGG, WALLACE . . . . .	Davis, Bloomfield
B.S., Iowa State College, 1931.	
MILLER, ARVID . . . . .	Decatur, Leon
B.S., Iowa State College, 1934.	
HUEHN, KERMITH . . . . .	Delaware, Manchester
B.S., Iowa State College, 1928.	
COTTON, C. C. . . . .	Des Moines, Burlington
B.S., Purdue University, 1916; M.S., Iowa State College, 1923.	

RANK, LOUIS . . . . .	Dickinson, Spirit Lake
B.S., Iowa State College, 1928.	
KERRIGAN, FRANK R. . . . .	Dubuque, Dubuque
B.S., Iowa State College, 1916.	
BALKEMA, MARION . . . . .	Emmet, Estherville
B.S., Iowa State College, 1927.	
McELROY, PAUL . . . . .	Fayette, Fayette
B.S., Iowa State College, 1931.	
BROWN, WM. H. . . . .	Floyd, Charles City
B.S., Iowa State College, 1931.	
HOWELL, MANNING . . . . .	Franklin, Hampton
B.S., Iowa State College, 1928.	
SCHNEIDER, FREDERICK . . . . .	Fremont, Sidney
B.S., Iowa State College, 1932.	
MARKEN, A. J., . . . . .	Greene, Jefferson
B.S., Iowa State College, 1932.	
PLAGER, L. W. . . . .	Grundy, Grundy Center
WILSON, E. PAUL . . . . .	Guthrie, Guthrie Center
B.S., Iowa State College, 1926.	
NICHOLS, H. M. . . . .	Hamilton, Webster City
B.S., Iowa State College, 1918.	
OBERHAUSER, S. J. . . . .	Hancock, Garner
B.S., Iowa State College, 1907.	
EYRE, WALTER B. . . . .	Hardin, Eldora
B.S., Iowa State College, 1926.	
ROSENBERGER, E. I. . . . .	Harrison, Logan
B.S., Iowa State College, 1919.	
BEATH, LEN R. . . . .	Henry, Mt Pleasant
B.S. Iowa State College, 1923.	
PAYNE, PAUL N. . . . .	Howard, Cresco
B.S., Iowa State College, 1918.	
GROVES, DONALD . . . . .	Humboldt, Humboldt
B.S., Iowa State College, 1932.	
BURNS, M. H. . . . .	Ida, Ida Grove
B.S., Iowa State College, 1925.	
ZENTMIRE, D. H. . . . .	Iowa, Marengo
B.S., Iowa State College, 1913.	
KRAUSE, F. E. . . . .	Jackson, Maquoketa
B.S. Iowa State College, 1930.	
BRYSON, HARRY . . . . .	Jasper, Newton
B.S., Iowa State College, 1931.	
LINDSAY, R. G. . . . .	Jefferson, Fairfield
GARDNER, EMMETT . . . . .	Johnson, Iowa City
SMITH, CARL R. . . . .	Jones, Anamosa
B.S., Iowa State College, 1931.	
SOULTS, MAURICE W. . . . .	Keokuk, Sigourney
B.S., Iowa State College, 1930.	

BROWN, A. L.	Kossuth, Algona
B.S., Iowa State College, 1922	
REDFERN, CARROL	Lee, Donnellson
B.S., Iowa State College, 1929	
CONN, REX	Linn, Cedar Rapids
B.S., Iowa State College, 1922.	
COWEN, JACK	Louisa, Wapello
B.S., Iowa State College, 1936	
MARTIN, STERLING	Lucas, Chariton
COVERDALE, R. J.	Lyon, Rock Rapids
B.S., Iowa State College, 1933	
AIRY, LOREN L.,	Madison, Winterset
B.S., Iowa State College,, 1935	
WOODFORD, RAYMOND E.	Mahaska, Oskaloosa
B.S., Iowa State College, 1918	
BROWN, WALTER	Marion, Knoxville
B S., Iowa State College, 1923	
PETERSON, II. J.	Marshall, Marshalltown
B S., Iowa State College, 1925	
LONGSTREET, JOHN	Mills, Malvern
B S., Iowa State College, 1932	
SHAW, CHARLES	Mitchell, Osage
B.S., Iowa State College, 1931	
MORRISON, E. E.	Monona, Onawa
B S., Iowa State College, 1930	
HAMILTON, HOWARD A.	Monroe, Albia
B.S., Iowa State College, 1932	
ANDERSON, VINCENT	Montgomery, Red Oak
B.S., Iowa State College, 1924	
RYLANDER, CARL	Muscatine, Muscatine
B.S., Iowa State College, 1927	
BIRLINGMAIR, M. G.	O'Brien, Primghar
B.S., Iowa State College, 1922	
NELSON, PAUL	Osceola, Sibley
B.S., Iowa State College, 1922	
GRISWOLD, DON G.	Page, Clarinda
B.S.A. Iowa State College, 1909	
HOFFMAN, RANDALL	Palo Alto, Emmetsburg
JONES, HERBERT	Plymouth, LeMars
B.S., Iowa State College, 1935.	
SCHMUECKER, ERVIN	Pocahontas, Pocahontas
B.S., Iowa State College, 1931.	
REYNOLDS, FRANK	Polk, Des Moines
B.S., Iowa State College, 1930	
LEINBACH, ROGER	Pottawattamie, E., Oakland
B.S., Iowa State College, 1934	
BERQUIST, REUBEN	Pottawattamie, W. Council Bluffs
B S., Iowa State College, 1929	

MILLER, HAROLD F. . . . .	Poweshiek, Brooklyn
B.S., Iowa State College, 1915.	
BLISS, J. A. . . . .	Ringgold, Mt. Ayr
LITTLEFIELD, KENNETH . . . . .	Sac, Sac City
B.S., Iowa State College, 1930.	
COMBS, ROBERT . . . . .	Scott, Davenport
ROSENFELD, GEO. A. . . . .	Shelby, Harlan
B.S., Iowa State College, 1926.	
NICOL, H. S. . . . .	Sioux, Orange City
B.S., Iowa State College, 1928.	
MONTGOMERY, H. J. . . . .	Story, Nevada
B.S., Iowa State College, 1920.	
BYRAM, BURNS . . . . .	Tama, Toledo
B.S., Iowa State College, 1921.	
DAVIE, ROBERT . . . . .	Taylor, Bedford
PARSONS, A. P. . . . .	Union, Creston
B.S., Iowa State College, 1926.	
SECOR, A. J. . . . .	Van Buren, Keosauqua
B.S.A., Iowa State College, 1905.	
OLSON, ROY E. . . . .	Wapello, Ottumwa
B.S., Iowa State College, 1934.	
NICKLE, L. J. . . . .	Warren, Indianola
ROUDABUSH, W. J. . . . .	Washington, Washington
B.S., Iowa State College, 1920.	
JUDD, C. E. . . . .	Wayne, Corydon
B.S., Iowa State College, 1932	
ANDERSON, GLENN . . . . .	Webster, Ft. Dodge
B.S., Iowa State College, 1930.	
MECHEM, CLARK . . . . .	Winnebago, Thompson
B.S., Iowa State College, 1927.	
WEIGLE, EVERETT . . . . .	Winneshiek, Decorah
B.S., Iowa State College, 1928.	
HAYES, H. M. . . . .	Woodbury, Sioux City
B.S., Purdue University, 1922.	
NELSON, R. T. . . . .	Worth, Northwood
B.S., Iowa State College, 1925	
VENDELBOE, JAY . . . . .	Wright, Clarion
B.S., Iowa State College, 1929.	

## HOME DEMONSTRATION AGENTS

NYGAARD, ANN . . . . .	Benton, Vinton
B.S., Iowa State College, 1933.	
JOHNSON, GLADYS . . . . .	Black Hawk, Waterloo
B.S., Iowa State College, 1934.	
FARRAR, EVELYN . . . . .	Dallas, Adel
B.S., Iowa State College, 1931.	

LINDGREN, ROBERTA THOMPSON B.S., Iowa State College, 1932.	Davis, Bloomfield
PFEIL, MARGARETTE B.S., Iowa State College, 1929.	Emmet, Estherville
LEWIS, LILLIAN B.S., Iowa State College, 1929.	Fayette, Fayette
BLANK, CLARA B.S., Iowa State College, 1932.	Franklin, Hampton
COCHRAN, LUCILE LACOCK B.A., State University of Iowa, 1925.	Hardin, Eldora
GRAVATT, CHARLOTTE B.S., Iowa State College, 1931.	Jasper, Newton
GOVE, LUCILLE B.S., University of Minn., 1930.	Linn, Cedar Rapids
PHIPPS, MABEL B.S., Iowa State College, 1919.	Madison, Winterset
HEDDLESON, LAURA B.S., Iowa State College, 1932.	Mahaska, Oskaloosa
ROCKHILL, MABEL B.A., State University of Iowa, 1920.	Marion, Knoxville
SADDORIS, HELEN B.S., Iowa State College, 1931	Marshall, Marshalltown
HOLLAND, CARRIE B.S., Iowa State College, 1933	Muscatine, Muscatine
COLBY, ELIZABETH B.S., Iowa State College, 1934	O'Brien, Primghar
DUNKELBERG, MARGARET B.S., Iowa State College, 1935	Palo Alto, Emmetsburg
WINGERT, DOROTHY B.S., Iowa State College, 1930	Scott, Davenport
MACUMBER, IRIS B.S., Iowa State College, 1930	Sioux, Orange City
HUFFMAN, EDITH MOSS B.S., University of Nebraska, 1923	Tama, Toledo
MACUMBER, WINIFRED A.B., Penn College, 1929	Warren, Indianola
EVERETT, ESTHER B.S., Iowa State College, 1933	Webster, Ft. Dodge
DILGER, HELENA B.A., State University of Iowa, 1925.	Winneshiek, Decorah
WAUGH, ODEAN Simpson College, 1927	Woodbury, Sioux City
ZOLLINGER, FLORENCE	Cerro Gordo-Mason City; Hancock, Garner
TRINDLE, PAULINE B.S., Iowa State College, 1927	Calhoun, Rockwell City; Humboldt, Humboldt
SIMS, PEARL B.S., Iowa State College, 1918	Cherokee, Cherokee; Plymouth, LeMars
RITTGERS, ZETTA B.S., Iowa State College, 1935	Guthrie, Guthrie Center; Audubon, Audubon

- SCOTT, LOUISE A. . . . Shelby, Harlan; E. Pottawattamie, Oakland  
B.S., Iowa State Teachers College, 1923
- WERTS, MARGARET . . . . . Adair, Greenfield; Cass, Atlantic  
B.S., Iowa State College, 1933
- SCHUERMAN, FLORENCE . . . . Iowa, Marengo; Poweshiek, Brooklyn  
B.S., Iowa State College, 1931
- FLYNN, MARY E. . . . . Lyon, Rock Rapids; Osceola, Sibley  
B.S., Iowa State College, 1931
- GAEDE, ADA-RAAKE . . . . Butler, Allison; Chickasaw, New Hampton  
B.S., Iowa State College, 1931
- EKQUIST, SELMA . . . . . Clay, Spencer; Dickinson, Spirit Lake  
B.S., Iowa State College, 1930
- THORNE, LENORE . . . . . Floyd, Charles City; Mitchell, Osage  
B.S., Iowa State College, 1931
- HEINS, PHYLLIS . . . . . Fremont, Sidney; Mills, Malvern  
B.S., Iowa State College, 1932
- SIMPSON, JOSEPHENE . . . . . Harrison, Logan; Monona, Onawa  
B.S., Iowa State College, 1931
- MORTON, CLAIRE-HOGE . . . Henry, Mt. Pleasant; Jefferson, Fairfield  
B.S., Iowa State College, 1933
- GREEN, RUTH MAY . . . . . Ida, Ida Grove; Sac, Sac City  
B.S., Iowa State College, 1935
- WYLIE, JULIETTE . . . . . Hamilton, Webster City; Wright, Clarion  
B.S., Iowa State College, 1925
- THOMPSON, NELLE . . . . . Adams, Corning; Union, Creston  
B.S., Iowa State College, 1934
- HICKS, MRS. RUTH SEATON . Buena Vista, Storm Lake; Pocahontas,  
Pocahontas  
B.S., Iowa State College, 1931
- JEBSEN, MARGHETTA . . . . . Carroll, Carroll; Greene, Jefferson  
B.S., Iowa State College, 1932
- BEELER, MILDREN . . . . . Des Moines, Burlington; Lee, Donnellson  
B.S., Iowa State College, 1930
- NEEDHAM, ELIZABETH . . Worth, Northwood; Winnebago, Thompson  
B.S., Iowa State College, 1935
- PACKER, VELMA . . . . . Keokuk, Sigourney; Wapello, Ottumwa  
B.S., Iowa State College, 1933

## COUNTY CLUB AGENTS

October 1936

- HAGER, R. F. . . . . Adair, Greenfield  
B. S., Iowa State College, 1931
- KELSEY, R. PEARL . . . . . Appanoose, Centerville
- SMITH, J. POTTER . . . . . Benton, Vinton
- LINWEAVER, GERALD . . . . . Black Hawk, Waterloo  
B.S., Iowa State College, 1929

SUCHER, ROBERT	Boone, Boone
B.A., Iowa State Teachers College, 1933	
IRWIN, DALE E.	Buchanan, Independence
B.S., Iowa State College 1930	
PETERSON, DANIEL	Clinton, DeWitt
B.S., Iowa State College, 1930	
CARLSON, OLAF I.	Crawford, Denison
B.S., Iowa State College, 1933	
LANGFITT, EARL A.	Davis, Bloomfield
GEIGER, HARLAN	Fayette, Fayette
B.S., Iowa State College, 1935	
WALKER, W. HAROLD	Franklin, Hampton
B.S., Iowa State College, 1935	
BOOTH, DWIGHT I.	Harrison, Logan
B.S., Iowa State College, 1934	
ASHBY, R. W.	Iowa, Marengo
B.S., Iowa State College, 1928	
TYLER, WAYNE	Jasper, Newton
B.S., Iowa State College, 1935	
SAUERBRY, MAX E.	Jones, Anamosa
B.S., Iowa State College, 1936	
OLSON, RALPH H.	Jefferson, Fairfield
B.S., Iowa State College, 1934	
CLOUGH, JOHN B.	Keokuk, Sigourney
B.S., Iowa State College, 1934	
LETSON, PERCY J.	Linn, Cedar Rapids
B.S., Iowa State Teachers College, 1928	
FOSTER, DELBERT T.	Louisa, Wapello
SODER, KEATS E.	Madison, Winterset
B.S., Iowa State College, 1933	
ZELLERS, MERVIN	Marion, Knoxville
B.S., Iowa State College, 1934	
HENDERSON, CHARLES R.	Montgomery, Red Oak
B.S., Iowa State College, 1933	
EDWARDS, VIVIAN	Muscatine, Muscatine
B.S., Iowa State College, 1918	
JOHNSON, J. CLIFFORD	Page, Clarinda
B.S., Iowa State College, 1932	
BROWN, LOREN	Poweshiek, Brooklyn
B.S., Iowa State College, 1934	
MOLLN, EDWARD	Ringgold, Mt. Ayr
GOELDNER, MELVIN H.	Story, Nevada
B.S., Iowa State College, 1922	
SCOTT, THOMAS N.	Tama, Toledo
B.S., Iowa State College, 1935	
SLEMMONS, G. H.	Van Buren, Keosauqua
B.S., Iowa State College, 1930.	



GOODELL, FLOYD . . . . .	Wapello, Ottumwa
HAHN, GROVER . . . . .	Webster, Ft. Dodge
SOMERS, MERLE . . . . .	Warren, Indianola
B.S., Iowa State College, 1923	
DIAMOND, WM. T. . . . .	Dallas, Adel
B.S., Iowa State College, 1936	
FEE, WILLARD . . . . .	Bremer, Waverly; Butler, Allison
B.S., Iowa State College, 1933	
STANDLEY, DEAN . . . . .	Hamilton, Webster City; Wright, Clarion
B.S., Iowa State College, 1935	
SWAN, GERALD . . . . .	Greene, Jefferson; Calhoun, Rockwell City
B.S., Iowa State College, 1935	
THORNGREN, DALE . . . . .	Mills, Malvern; W. Pottawattamie, Council Bluffs
HENDERSON, PAUL W. . . . .	Cerro Gordo, Mason City; Hancock, Garner
B.S., Iowa State College, 1936	Floyd, Charles City; Worth, Northwood
MIDDLETON, TALFORD . . . . .	Marshall, Marshalltown
B.S., Iowa State College, 1936	

### ASSISTANT COUNTY AGENTS

WALLACE, J. J. . . . .	Four County Farm Management, Cedar Rapids
B.S., Iowa State College, 1916	
HOWELL, H. B. . . . .	Four County Farm Management, Davenport
B.S., Iowa State College, 1934.	
DILLON, GEO. . . . .	Four County Farm Management, Ames
B.S., University of Wisconsin, 1914.	
BURSON, PAUL . . . . .	Four County Soils Agent, Toledo
B.S., Iowa State College	

### ENGINEERING EXTENSION

FABER, DANIEL C., E.E. . . . .	Director, 1918, 1914
B.S., University of Illinois, 1908; E.E., <i>ibid.</i> , 1911.	
BAIRD, EARL S. . . . .	Associate Professor, Industrial Management, 1924
B.S., Iowa State College, 1926; M.S. <i>ibid.</i> , 1932.	
GRIFFITH, W. I. . . . .	Associate Professor, Radio Broadcasting, 1925
B.S. (Agr.), Iowa State College, 1899; M.Di., Iowa State Teachers College, 1905.	
MURPHY, LINDON J. . . . .	Associate Professor, Municipal Engineer, 1926, 1921
B.S., Iowa State College, 1921; M.S., <i>ibid.</i> , 1924; C.E., <i>ibid.</i> , 1926.	
MAHONE, LESLIE W. . . . .	Assistant Professor, Civil Engineer, 1930, 1921
B.S. (C.E.), Iowa State College, 1920; M.S., <i>ibid.</i> , 1927.	
HOLBROOK, ROYAL H. . . . .	Combustion Engineer, 1919
KOOSER, HEROLD L. . . . .	Assistant Professor, Visual Instruction, 1933, 1924
B.S., Iowa State College, 1923.	

# General Information

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## ADMINISTRATION

The laws of the United States and the State of Iowa provide for the scope and the management of the State College of Agriculture and Mechanic Arts. It is under the State Board of Education, which consists of nine members nominated by the Governor and confirmed by the Senate. This board appoints a finance committee consisting of three men who give their entire time to the management of the five state educational institutions of Iowa of which the Board is in charge, under provisions of the law and such rules and regulations as the State Board of Education may prescribe.

## GOVERNMENT

The discipline of the College is confined mainly to dismissing those who prove, on fair trial, to be too independent to submit to needful authority or too indifferent to take advantage of their opportunities. The final decision in all cases of discipline rests with the President of the College, except when he delegates such power in particular cases to the Deans or to some one of the standing committees of the Faculty.

## HISTORY

The following chronological table gives some of the significant dates in the history of the college.

- 1858 March 22. Establishment of the Iowa State College of Agriculture and Mechanic Arts by act of the Seventh General Assembly.
- 1859 Purchase of original farm of 648 acres, including the College Campus.
- 1860—1861. Erection of the Farm House.
- 1862 July 2. Approval by President Abraham Lincoln of the Morrill Land-Grant College Act donating public lands to the several states and territories to provide for colleges for the benefit of Agriculture and Mechanic Arts.  
September 11. Acceptance of grant by Iowa.
- 1865—1868. Erection of the "Main Building."
- 1868 May 11. Appointment of A. S. Welch, M.A., LL.D., as President.
- 1868 Oct. 21, to 1869, Mar. 15. Service of George W. Jones, M.A., Acting President, during President Welch's absence in Washington, D. C., as U. S. Senator.

- 1868 Oct. 21. Opening of The College to students.
- 1869 Completion of first president's residence.
- 1869 Erection of the house known as "The Maples."
- 1870 Erection of the house now occupied by Dean Marston.
- 1870 Purchase of the North Farm. 140 acres of this farm still owned by the college.
- 1870 Erection of first part (30 feet by 60 feet one-story with basement) of the Chemical Laboratory.
- 1871 Addition of two wings to the "Main Building."
- 1875 Addition of Physical and Chemical Laboratories, 70 feet by 40 feet—3½ stories, including basement, to east side of Chemical Laboratory constructed in 1870.
- 1879 Erection of first creamery, 16 feet by 24 feet, east of Farm House.
- 1880 Erection of boarding cottage for young men, "Stanton Cottage."
- 1882 July 1 to Nov. 1. Service of Charles E. Bessey, Ph.D., as Acting President during President Welch's absence in Europe.
- 1882 Erection of Second Boarding Cottage for young men. Site: West of Alumni Hall. Known as "Kirkwood Cottage." Taken down when Alumni Hall was built.
- 1882 Purchase of 10 acres at northwest corner of original farm.
- 1883 Dec 1. Appointment of Seaman A. Knapp, A.M., LL.D., as President.
- 1883 Erection of "Engineering Hall," now called the Laboratory of Mechanics. Cost \$4,500.
- 1884 Erection of office building for offices of the President, Secretary, and Treasurer.
- 1884 First installation of electric lights in the Main Building.
- 1885 Feb. 1. Appointment of Leigh Hunt, A.M., as President.
- 1885 Erection of the Veterinary Buildings on the site now occupied by Memorial Union.
- 1886 July 20. Appointment of William I. Chamberlain, A.M., LL.D., as President.
- 1887 March 2. Passage by Congress of the Hatch Act to promote scientific investigation through Agricultural Experiment Stations in the several states.
- 1890 August 30. The second Morrill Act for additional endowment.
- 1891 Feb. 1. Appointment of William M. Beardshear, A.M., LL.D., as President.
- 1891 Erection of Morrill Hall, to be used as a library, chapel, and museum.
- 1892 Erection of Agricultural Hall, now called the Botany Building. Cost \$37,000.
- 1892 Erection of Creamery Building, with second-floor dormitory.
- 1895 Erection of Margaret Hall. This was the first women's dormitory outside of Main Building. Cost \$54,000.
- 1897 Construction of the water tank and water system, designed by A. Marston, Head of Civil Engineering Department.
- 1897 Erection of forge shop and foundry. Cost \$5,000.
- 1898 Erection of carpentry shop. Cost \$5,000.
- 1898 Purchase of the Kintzley 40 acres as an addition to main farm.

- 1898 Construction of the sewage disposal plant, as designed by Anson Marston, Head of Civil Engineering Department. These were the first sewer beds built in Iowa.
- 1898 Erection of carpentry shop. Cost \$5,000.
- 1899 Erection of Campanile. Stanton chime of ten bells installed.
- 1900 February 28. Granting by The Legislature of the first definite educational support to this college, in the sum of \$25,000 per annum.
- 1900—1903. Erection of Engineering Hall. Occupied January, 1903. Cost \$218,500.
- 1900 Erection of brick horse barn and stock pavilion. Cost \$14,588.97.
- 1900 Erection of President's Residence, "The Knoll."
- 1900 December—Burning of the north wing of old Main Building.
- 1902 August 5. Death of President William Miller Beardshear at his home on the Campus.
- 1902 August 6. Appointment of Edgar W. Stanton, B.S., LL.D., as Acting President.
- 1903 Sept. 1. Appointment of Albert Boynton Storms, LL.D., as President.
- 1903 Erection of the fireproof Agricultural Hall Annex, now Botany Annex. Cost \$53,752.
- 1903—1905. Erection of Central Building. Cost \$360,000.
- 1904—1905. Erection of Dairy Building—now called Agricultural Annex. Cost \$55,000.
- 1904—1907. Erection of Alumni Hall. Present home of Y. M. C. A. and Y. W. C. A. Building erected by faculty, alumni, and friends. Cost \$35,000.
- 1905 Purchase of the Dairy Farm of 170 acres.
- 1906 March 16. Passage by Congress of the Adams Act, which increased the support of Agricultural Experiment Stations.
- 1906 Purchase of 80 acres northeast and 60 acres northwest of the main farm.
- 1906 Purchase of 10 acres addition to Dairy Farm, and 20 acres for Poultry Farm.
- 1906—1907. Erection of Hall of Agriculture. Cost \$340,000.
- 1906 First appropriation by state for Extension Work.
- 1906 Erection of forge shop. Cost \$4,500.
- 1906 Erection of machine shop. Cost \$18,000.
- 1906—1908. Erection of central heating plant. Cost \$165,000.
- 1907 March 4. Passage by Congress of the Nelson Act for the further endowment of Colleges of Agriculture and Mechanic Arts.
- 1909—1910. Erection of Engineering Annex. Cost \$49,000.
- 1910 Sept. 1. Appointment of Edgar W. Stanton, LL.D., as Acting President.
- 1910—1911. Erection of Home Economics Building. Cost \$75,000.
- 1910—1912. Erection of Veterinary Buildings. Cost \$150,000.
- 1911—1913. Erection of Gymnasium. Cost \$150,000.
- 1912 Sept. 1. Appointment of Raymond A. Pearson, LL.D., as President.
- 1912—1914. Erection of the Mechanical Engineering Laboratory. Cost \$52,105.

- 1913 Paving of college roads.
- 1913—1914. Erection of the Transportation Building. Cost \$65,000.
- 1913—1914. Erection of the Horticultural Laboratory and Greenhouse. Cost \$26,000.
- 1913—1914. Erection of Chemistry Building. Cost \$311,032.
- 1914 May 8. Smith-Lever Act for co-operative agricultural extension work.
- 1914 Purchase of Agronomy Farm of 165 acres.
- 1914—1936. Erection of group of dormitories for women in the south-east corner of the campus, at a cost of \$878,386.00. This group consists of six brick buildings: Mary Lyon, Alice Freeman, Clara Barton, Mary B. Welch (East and West), New Hall, and two frame buildings, Oak and Elm Lodge. These frame buildings were taken over for the housing of men in the fall of 1931.
- 1916 Erection of Science Hall. Cost \$65,000.
- 1917 Feb. 23. Smith-Hughes Act for training teachers in vocational education.
- 1917 April 20 to Nov. 21, 1918. Service of Edgar W. Stanton, LL.D., as Acting President during the absence of President Pearson on war service with the Department of Agriculture.
- 1918—1919. Erection of College Hospital for students. Cost \$51,000.
- 1920 Purchase of Animal Husbandry Experimental Farm. 182 acres. Land south of Lincoln Highway between Beach Avenue and Squaw Creek.
- 1921 Purchase of Veterinary Investigation Farm—60 acres, and an addition to Poultry Farm—3 acres.
- 1922 Erection of Physics Building. Cost \$258,512.
- 1923 Erection of Armory. Cost \$155,000.
- 1923—1924. Erection of Library. Cost \$626,474.
- 1924 Erection of addition to College Hospital. Cost \$104,200.
- 1924—1925. Erection of two additional groups of buildings, which have not been mentioned in the above; one the Service Unit for physical plant, which is near the Power Plant and the other the Brick Barns, including the Artillery Stables. Cost \$64,600.
- 1925 Feb. 24. Passage by Congress of the Purnell Act for an increased annual appropriation for Agricultural Experiment Stations and the regulation of the expenditure thereof.
- 1925 Purchase of additional land for Dairy Farm—25 acres; and for Poultry, Genetics, and Botany—40 acres.
- 1925—1926. Erection of Home Economics Building. Cost \$540,000, including the remodeling of the Home Economics Building, built in 1910-1911.
- 1926 Feb. 8 to July 17. Service of Herman Knapp, LL.D., as Acting President during President Pearson's leave of absence in Europe.
- 1926 Sept. Appointment of Herman Knapp, LL.D., as Acting President.
- 1926 Purchase of 10 acres additional land, south of Agronomy Farm.
- 1927 Sept. 1. Appointment of Raymond M. Hughes, LL.D., as President.
- 1927 Erection of first unit of Men's Dormitory Group. Cost \$148,000.
- 1927 Reception of gift from Sallie S. Smith estate—"Gables" for International House.

- 1927—1928. Erection of Dairy Industry Building. Cost \$430,000.  
 1927—1928. Erection of Memorial Union, first unit. Cost \$750,000.  
 Built by alumni, faculty, and friends.  
 1928 May 22. Capper-Ketcham Act for further development of agricultural extension work.  
 1929 Installation of Stanton Carillon in Campanile. Twenty-six bells added to the original ten bells. Weight 32,000 pounds. Inaugurated Oct. 6 by a concert given by Anton Brees, Belgian Bellmaster.  
 1930 Horse Barn remodeled for the Department of Landscape Architecture. Cost \$20,000.  
 1930 Addition to Engineering Annex. Cost \$8,000.  
 1931 Erection of Insectary Greenhouse. Cost \$6,500.  
 1931 Addition to Chemical Engineering Building. Cost \$13,500.  
 1933 Genetics Laboratory. Cost \$11,500.  
 1934 Central Stores Building. Cost \$35,000.  
 1934 Agricultural By-Products Laboratory. Erected with Federal funds by the Bureau of Chemistry and Soils of the U. S. D. A. Cost \$90,000.  
 1935 June 29. Bankhead-Jones Act to promote and aid agricultural research, co-operative extension work, and further endow land-grant colleges.  
 1936 March 17. Appointment of Charles Edwin Friley, A.M., LL.D., as President.  
 1936 June 8. George-Deen Act for the further development of vocational education.  
 1936 October 7. Inauguration of President Friley.  
 1936 Erection of Dairy Barn. Cost \$39,524.93.  
 1936 Erection of Steam and Gas Laboratory. Cost \$39,874.89.

### STANDING OF THE COLLEGE

Iowa State College is accredited by the North Central Association of Colleges and Secondary Schools as a degree-granting institution. The College is also fully recognized by the Association of American Universities.

### STATEMENT OF INCOME, EXPENSES, AND RESOURCES

For Year Ended June 30, 1936

#### INCOME:

##### EDUCATIONAL AND GENERAL

Student Fees	\$ 394,678.66
State Appropriation	1,940,000.00
Federal Appropriation	664,937.75
Income from Endowment	23,958.61
Sales and Service	321,974.06
Gifts	29,278.41
Miscellaneous	430.55
	<hr/>
Total Educational Income	\$3,375,258.04
Auxiliary Activities	431,700.54
Non Educational	8,312.12
	<hr/>
TOTAL	\$3,815,270.70

EXPENSES:

EDUCATIONAL AND GENERAL

Administration	\$ 104,435.75
General Expense	55,172.33
Instruction and Departmental Research	1,538,060.56
Organized Research	465,107.14
Extension Service	705,442.39
Library	104,222.93
Operation and Maintenance of Physical Plant	319,319.34
Equipment	60,041.20
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Total Educational Expense	\$3,351,801.64
Auxiliary Enterprises	381,542.34
Other Non Educational Expense	10,738.37
Reserve for commitments, Jobs in Process, etc.	71,188.35
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TOTAL	\$3,815,270.70

RESOURCES:

VALUE OF

Lands, Buildings and Equipment	11,133,837.74
Loan Funds	53,699.89
Endowment Investments	852,131.08
Other Assets	360,448.30
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TOTAL	\$12,400,117.01

LOCATION

Ames is almost at the geographical center of the state of Iowa, on the main line of the Chicago & North Western Railroad. It is about thirty-five miles north of Des Moines, with which it is connected by the Chicago & North Western Railroad. A branch of the Chicago & North Western from Ames serves the northern part of the state. Several bus lines pass through Ames making the city accessible by bus from all sections of Iowa and neighboring states.

Ames is a most desirable town for wholesome college influences. Its people are thrifty, enterprising and cordial. The town has an excellent system of public schools, numerous churches, waterworks, and electric lights, and it also has a good city government. It is an inviting community for heads of families who wish to educate their children and enjoy a good environment at a reasonable expense.

GROUNDS

The entire college domain includes 1,996 acres. The central campus with its beautiful walks and drives, its trees, shrubbery, and flower gardens, and its large and stately buildings is especially attractive.

## BUILDINGS AND EQUIPMENT

Seventy buildings for college purposes besides dwelling houses and the buildings for farm stock, machinery, and work have been erected by the State for the various departments of the College. The map in the front of this catalogue gives the names of the buildings and their location. The following is a brief description of the more important buildings and items of equipment:

**CENTRAL BUILDING**, erected on the site of the old Main Building, accommodates the executive offices, and the Departments of English, Modern Language, History and Government, Mathematics, Psychology, and Public Speaking. The building is of gray Bedford stone, built in the Roman Renaissance style, a style that is also used for the Engineering and Agricultural Halls.

**LIBRARY BUILDING**. For description see page 90.

**THE MEMORIAL UNION** was opened in the fall of 1928. This structure was erected to the memory of Iowa State men and women who served in the World War, and is an all-college social center. Funds for the erection and completion of this building are being provided by pledges from alumni, students, and faculty.

**ALUMNI HALL** is 87 by 48 feet, colonial style, three stories and a basement. It was built by the alumni and students of the college. On the first floor are reception rooms, reading rooms, and offices of the Young Men's and Young Women's Christian Associations; on the second floor, an assembly room, committee rooms, and social rooms. The third floor is used for dormitory purposes. In the basement are a dining room, a kitchen, and a game room.

**RESIDENCE HALLS FOR WOMEN**. College homes for 700 women students are provided in seven halls. Mary Lyon, Clara Barton, Alice Freeman, Mary B. Welch (West), Mary B. Welch (East), and New Hall are located on a portion of the college grounds set apart especially for the homes of women students. Clara Barton and Alice Freeman Halls are co-operative halls where the women students are able to save approximately one-half the price of board by doing about one hour's work each day. Margaret Hall, for graduate students, is located on the central campus. The halls have ample and attractive living rooms. Three of the halls have large recreation rooms. The dining rooms are in charge of a dietitian who furnishes wholesome, well-prepared, balanced meals. An especially qualified hall director supervises the student life in each building. Everything possible is done for the comfort and happiness of the women students.

**RESIDENCE HALL FOR MEN**. A limited number of students make their home in the Men's Hall. The hall has a splendid location on the campus.

**THE INTERNATIONAL HOUSE**, long known as "The Gables," a large brick residence in spacious and beautiful grounds, was acquired by the College through the generous bequest of Mrs. Sallie Stalker Smith. This house once occupied by the first President of the College, is now used as a home for male foreign students and as headquarters for the Cosmopolitan Club.



MORRILL HALL, one of the oldest of the College buildings, was named in honor of Justin S. Morrill, the originator of the "Land Grant" for colleges of agriculture and mechanic arts. In it are the zoological museum, the offices of the Agricultural Extension Department, and the bulletin shipping rooms.

THE CAMPANILE is a detached tower 110 feet in height, built of buff brick with terra cotta trimmings. This tower stands in the center of the campus and contains the Edgar W. and Margaret McDonald Stanton Memorial Carillon of thirty-six bells. These bells were manufactured by John Taylor and Company, of Loughborough, England. Ten of them were imported in 1899 and twenty-six more bells were added in 1929 changing the chime to a carillon. The Carillon was inaugurated by a concert given by Anton Brees, Belgian Bellmaster, on October 6, 1929.

### DIVISION OF AGRICULTURE

AGRICULTURAL HALL is 234 by 78 feet, and four stories in height. It is fireproof throughout, and arranged with suitable conveniences and facilities for efficient work in agricultural instruction and investigation. It contains the offices and classrooms of the departments of Agronomy, Animal Husbandry, Horticulture and Forestry, and Genetics. The Agronomy Department has nine laboratories in this building; these are provided with modern equipment for studying soil fertility, soil management, soil surveying, and soil bacteriology.

THE DAIRY INDUSTRY BUILDING is a two-story structure, 205 by 64 feet, with two one-story wings, each of which is 208 by 40 feet.

The main building contains testing, farm dairy, bacteriology and research laboratories, classrooms, and the general office. The laboratories for the manufacture of butter, cheese, ice cream, condensed and powdered milk and for handling market milk are located in the one story wings.

AGRICULTURAL ANNEX is a three-story brick structure occupied by the Departments of Agricultural Economics, Technical Journalism, and Vocational Education.

THE GENETICS LABORATORY which was completed late in 1932, is a two-story fireproof brick structure 32 by 60 feet in outside dimensions. The building is being used for genetic research in both animals and plants. The basement floor contains animal rooms, an incubation room, feed room and root cellar, while a seed laboratory, general laboratories and office space are provided on the upper floor. The laboratories are equipped for bacteriological and other biological work.

THE HORTICULTURAL BUILDINGS comprise two groups of laboratories, two ranges of greenhouses and various farm buildings. The old Horticultural laboratory is a two-story brick building, the main floor of which is equipped for elementary instruction. It is equipped with a special tool room and a refrigerator to hold fruits in storage for class purposes. The new laboratory, of Bedford stone, houses an experimental cold storage plant, laboratories for advanced research, the experiment

station headquarters for horticulture, and potting and sales rooms for the greenhouses.

The principal range of greenhouses adjoins the new laboratory. The houses comprise 33,400 square feet under glass, and are of an approved type of iron frame construction. Altogether there are fourteen houses in this range, mostly 75 by 25 feet. These houses provide facilities for instruction in commercial floriculture, plant propagation, vegetable forcing, and general research work in plant breeding and other horticultural problems.

The farm buildings, in addition to the usual service barns for horses and implements, include a specially constructed seed-curing laboratory and a fine four-cell cool-air storage for plants, vegetables, and fruits.

**THE LANDSCAPE ARCHITECTURE BUILDING** is a three-story brick structure, 100 by 40 feet, occupied entirely by the Department of Landscape Architecture. The top floor is used for drafting rooms, the ground floor for offices, lecture and classrooms, and exhibition studios. The basement is devoted to plant laboratory, storage, herbarium, and classrooms. This Studio has an attractive setting of gardens and lawn areas.

**THE MEATS LABORATORY**, built of brick, 74 by 112 feet, is fully equipped for the killing of cattle, sheep, and hogs, for the handling of carcasses, cuts, and by-products, and for the curing of meats. One section is devoted to the killing floor, refrigerators, and cutting room; the second is a pavilion into which may be taken the live animals to be slaughtered; the third, an amphitheater seating 500 people, is for use during short courses and special demonstrations.

**JUDGING PAVILIONS AND BARNs**, built of brick and thoroughly modern, are located adjacent to the main campus. Pavilions are available for classroom and laboratory work in livestock judging and management.

**LIVESTOCK.** The entire livestock equipment is available for instructional work which covers all phases of selection, breeding, feeding, management, and marketing of the various breeds and classes of farm animals, the killing of meat animals, and the cutting and curing of meats.

**DAIRY CATTLE.** Representative animals of each of the five major dairy breeds—Holstein, Jersey, Guernsey, Brown Swiss, Ayrshire—and one dual-purpose breed—Milking Shorthorn—are maintained at the Dairy Husbandry Farm a mile south of the campus. These animals are used for both instructional and experimental work. Records of the age, weight, period of gestation, feed consumption, milk production and net profit on all the animals on the Dairy Farm are kept for use in class instruction.

Despite the year around use of the dairy herd in classroom and experimental work it is producing in an excellent manner. Production records made by the cows in each of the breeds rank among the best that have been made in Iowa and several have won national recognition. During the past year the entire herd of 94 milking cows produced, according to the records of the Cow Testing Association, an average yearly production of 369 pounds of butterfat per cow.

**BEEF CATTLE.** Representatives of three breeds of beef cattle are available as breeding stock and steers for instructional work in judging, feeding, and management. Winnings each year at the International

Live Stock Exposition indicate the high quality of the herd. A total of twenty prizes was won at the 1936 show, including a first prize Shorthorn steer and first on Shorthorn steer herd.

**Hogs.** At the 1936 International Live Stock Exposition 23 premiums were won on fat barrows, which include 1 reserve breed champion, 2 firsts, 7 seconds, 3 thirds, 1 fourth, 4 fifths, and 4 sixths.

**SHEEP.** There are representatives of four mutton breeds and one fine wool breed maintained in the College flock. At the 1936 International Live Stock Exposition, representatives from the flock won 19 ribbons in competition with the leading flocks in this country and Canada. On wool the winnings were 3 firsts, 2 seconds, 2 thirds, and 1 fourth. The grand champion fleece of the purebred wool show was from a Rambouillet ram bred by the College.

**DRAFT HORSES.** Representatives of three breeds are maintained. The Belgian stud is headed by the imported stallion, Farceur de Grandglie. At the 1933 National Belgian Horse Show, eleven head of Belgians were shown and won a total of 17 ribbons, which included 2 firsts, 2 seconds, and 3 thirds. The Percheron stud is headed by Carcellus, fifth prize aged stallion at the 1936 International Live Stock Exposition, and includes Olive Palmer, first prize three-year old mare, and several other prize winning animals. Seven horses exhibited at the 1936 International won a total of nine prizes. Several good representatives of the Clydesdale breed are also owned by the College.

**THE POULTRY FARM.** On this farm of thirty-six acres, seven of the leading breeds and varieties of poultry are kept and bred for class purposes. The farm equipment includes many types of poultry houses. There are two laboratory buildings, one at the farm and the other on the campus. The two types of mammoth incubators and several types of small incubators offer exceptional facilities for major work in hatchery management. Ten large feeding batteries afford an excellent opportunity for carrying on tests in fattening market poultry. Houses and brooder equipment are provided for the rearing of 10,000 chicks and the maintenance of 3,000 layers and breeders. Several hens on the farm have production records of 300 eggs per year and above, and many are descendants of a White Leghorn hen which produced 1509 eggs in seven years.

**AGRONOMY FARM AND EXPERIMENTAL FIELDS.** The Agronomy Farm consists of 170 acres and is utilized entirely for field experiments in farm crops and soils, including the testing of varieties, the breeding of cereals and forage crops, studies of new crops, and the study of soil management problems with special reference to the use of manures, lime, and various fertilizers. Forty acres adjoining the Agronomy Farm are used exclusively for Forage Crops experiments.

**THE AGRONOMY FARM LABORATORY AND SEED STORAGE BUILDING** is a modern, two-story, brick and tile structure, used for drying and storing farm seeds, implement storage and grain breeding laboratories. Among the special features are corn drying rooms, seed cleaning equipment, and bins for small grains.

**THE ANIMAL HUSBANDRY EXPERIMENTAL FARM** of 182 acres is used ex-

clusively for feeding and breeding experiments with beef cattle, hogs, and sheep.

**THE DAIRY HUSBANDRY FARM.** This farm, located about one mile south of the main campus, supplies a large part of the feed necessary for the dairy herd. Co-operative experimental work with pastures and other crops is also in progress at this farm.

The building equipment includes a dairy barn, calf barn, feed storage barn, horse barn, experimental barn, six-room farm house, milk house, nine-room dormitory, judging pavilion, and silos. These are all modern in construction and design.

## DIVISIONS OF AGRICULTURE AND ENGINEERING

**THE AGRICULTURAL ENGINEERING LABORATORY** consists of a one-story main building, a machine shed, and enclosed courtyard. It houses the offices, class and drawing rooms, shops and laboratories of the Department of Agricultural Engineering. This building, with almost 40,000 square feet of floor area contains excellent equipment in its shops and laboratories and provides the facilities needed for both under-graduate and graduate instruction.

## DIVISION OF ENGINEERING

**ENGINEERING HALL** is the heart of the group of laboratory and classroom buildings on the engineering campus. It is a four-story building of Bedford stone, housing the administrative headquarters of the division as well as the offices of the Civil, General, Mechanical Engineering, and Engineering Drawing Departments, and the Engineering Extension Service. In the building are numerous class and drafting rooms, a branch library and study room, and an assembly room with a seating capacity of 400. One portion of the building is fitted up as an instrument room for the surveying instruments employed in civil engineering instruction.

**ENGINEERING ANNEX** accommodates the Departments of Ceramic Engineering, Electrical Engineering, and Architectural Engineering. In addition to general offices, classrooms, and drafting rooms, there are four well equipped laboratories for dynamo electric machinery and one for telegraph, telephone, and radio equipment of the Electrical Engineering Department. The Architectural Engineering Department drafting and lecture rooms, their exhibits of designs, and their special facilities for graduate work are housed in this building.

A wing of the building is occupied by the Department of Ceramic Engineering with its laboratories consisting of clay working, kiln, pottery, and glaze rooms with ample equipment of modern design. One room in this wing is fitted up as a laboratory for the Mining Engineering Department. The entire top floor of the south wing of the building is given over to WOI, the college radio broadcasting station, with its studio and sending equipment. The station also uses space on the second floor as a receiving station for the United States Department of Agriculture crop and market reports which are received each day.

**CHEMICAL ENGINEERING HALL.** The present structure comprises about one-third of the building, which is planned eventually to provide for the

Department of Chemical Engineering. A portion of the laboratory is two stories high to permit setting up heavy equipment required for research in the development of Iowa industries and the utilization of agricultural waste products. Two large laboratory rooms and several small ones are devoted exclusively to instruction in Chemical Engineering and all of the research equipment is available for instruction as needed.

**THE INDUSTRIAL ARTS BUILDING** contains offices and shops of the Industrial Arts Department, a freehand drawing room for the Architectural Engineers, and computing rooms for classes in engineering economics. The Engineering Experiment Station Laboratory occupies a wing of the building. It is equipped for carrying on experiments in sewage disposal, properties of materials and the strength of various engineering products made of metal, concrete, and ceramic products. Its main room contains testing machines with capacities as great as 300,000 pounds and a traveling crane for handling heavy experimental specimens. The basement is arranged for concrete and concrete materials research.

**MECHANICAL ENGINEERING LABORATORY BUILDING.** The laboratory work conducted in this building is extensive and quite varied in character. One section of the building contains a modern steam boiler plant with overhead coal bunkers, ash handling equipment, and automatic stokers. Adjacent to the steam plant are numerous steam prime movers, air compressors, refrigerating machines, and pumps; each typical of those encountered in modern power plant and factory installations. A portion of the building is devoted to internal combustion engines and the necessary dynamometers and accessories required in engine testing. The balcony is given over to laboratories for fuel, oil, and gas analyses, and class and conference rooms.

In a new wing of the building there have been installed furnaces and accessories for instruction in the heat treating of metals and a laboratory for metallography. There is a modern foundry and pattern shop and equipment for studying various methods of fabricating metals.

Still another section of the building is equipped as a machine shop with modern equipment of wide variety to provide facilities for instruction in the machining of metals.

**AERONAUTICAL LABORATORY.** The Aeronautical Laboratory is installed in a one story brick building which is equipped for testing airplane engines and for the work in airplane design. The equipment includes many types of airplane parts and engines of various sizes and types.

**ENGINEERING EXHIBIT HALL.** A temporary building constructed during the World War for the training of mechanics for military service has been converted into an exhibit hall which is used in connection with the conferences and short courses conducted by the Engineering Extension Service. The building is equipped with the power circuits and benches and tables suitable for the installation of exhibits of a wide variety.

**THE LABORATORY OF MECHANICS** is the original engineering hall, built in 1883 and remodeled at various times in recent years. It contains laboratories and equipment for instruction in the properties of materials and in the theoretical hydraulics. It is equipped with testing machines of many

kinds and much special apparatus for materials work. The road materials laboratory in this building has been recently expanded and modernized in accordance with the development of the highway field.

**AGRICULTURAL BY-PRODUCTS LABORATORY.** The Agricultural By-Products Laboratory was constructed by the Federal Government to house the Ames Field Station of the United States Department of Agriculture. In this building some 15,000 square feet of floor space are available for research in the field of the industrial utilization of agricultural by-products. The research program is conducted co-operatively by the Bureau of Chemistry and Soils of the United States Department of Agriculture and the Iowa Engineering Experiment Station.

### DIVISION OF HOME ECONOMICS

**HOME ECONOMICS HALL** is an imposing three-story building of Bedford stone about 400 feet long, with adequate provisions for office space, laboratories, and classrooms for the eight departments which it houses. In addition, it contains an auditorium with a seating capacity of 700, a Fireplace Room used for social gatherings, a Seminar Room, and a Tea Room with a seating capacity of 100

**THE NURSERY SCHOOL AND ANNEX** are located on an acre lot well planted in shade trees within a short distance of Home Economics Hall. There is ample space for outdoor play apparatus, gardens, and houses for pet animals. The main building is a low two-story brick structure especially equipped for children of from three to five years of age. The Annex is a frame residence equipped for the younger children.

**THE HOME MANAGEMENT HOUSES**, four in number, are frame buildings, each accommodating eight students, an infant, and a resident advisor. These are furnished for a family in modern circumstances and serve as laboratories for the course in home management.

### DIVISION OF INDUSTRIAL SCIENCE

**BOTANY HALL** houses the offices, laboratories, and classrooms of the Department of Botany. There are eleven classrooms and laboratories devoted to teaching, eight laboratories to research, and two to service.

The botanical museum and herbarium are housed in the fireproof Annex. The refrigeration laboratory in the basement consists of four rooms ranging from 40°F. above to 40°F. below. An adjoining laboratory is given over to grosser types of work, such as mills for grinding, apparatus for distilling water, and autoclaving soils. The department has greenhouse space available for growing class material, student laboratory work with growing plants, and research by graduate students.

Several experiment station laboratories are housed on the top floor of the Annex and the seed laboratory in one-half of the top floor of the main building. A part of the ground floor houses some of the work of the Department of Physical Education for Women.

**CHEMISTRY HALL**, housing the Departments of Chemistry and of Geology, is a modern, well-equipped building, designed for research as well as class and laboratory teaching. It is a three-story brick structure

with a usable basement. There are four wings which accommodate the large laboratories and some of the classrooms. The wings are connected by a central structure in which are located the main offices, the storeroom system, many small laboratories and research rooms, and the auditorium.

The arrangement of the laboratories, special and research rooms for advanced students, and offices is such that each floor is devoted to certain general classes of work. The storeroom system serves each floor independently.

**PHYSICS BUILDING.** In the central structure, two stories in height, are grouped three lecture rooms and a preparation room. Adjacent to this and convenient to other classrooms and laboratories is a large apparatus room. There are four light courts, two on either side of the central structure. Extending entirely around the central group and the courts is a one-story structure containing the laboratories, classrooms, shops, and offices.

Most of the laboratories and shops have concrete floors resting upon the ground, thus giving a solid foundation for experimental apparatus. Beneath the main corridor, which encircles the entire building, is a "service corridor" containing all service circuits. These circuits include electric lines, and gas, air, vacuum, and water pipes.

The college instrument shop, which constructs and repairs scientific apparatus used in the entire college, is located in this building. A number of rooms in the northeast basement are occupied by the Department of Zoology and Entomology.

**THE SCIENCE BUILDING** has four stories and basement. The first and second floors and part of the basement are occupied by the Department of Bacteriology.

The general laboratory located on the second floor is equipped with standard tables, lockers, sterilizers, autoclaves, incubators and microscopes. Laboratories for advanced work in general, food, sanitary, and physiological bacteriology and immunity are provided, with dispensing rooms, offices, classrooms, and research laboratories.

Research laboratories in sanitary bacteriology and for the Engineering Experiment Station are located on the second floor.

Research laboratories for the Agricultural Experiment Station and for the study of fermentations and immunity are located on the first floor and in the basement. Two large electrically controlled incubation rooms, especially constructed inoculating room and high temperature incubators are available. Equipment desirable for fermentation studies is adequate for fundamental and applied research.

(Laboratories in soil bacteriology are housed with the Department of Soils on the first floor of Agricultural Hall and in dairy bacteriology on the second floor of the Dairy Industry Building.)

Instruction in zoology, physiology, entomology, and apiculture are given in Science Hall by the Department of Zoology and Entomology. The laboratories are equipped with microscopes, models, mounted specimens, charts, constant temperature baths and cabinets, and other equipment and supplies needed for undergraduate and graduate instruction.

Laboratory work in zoology, embryology, and entomology is given in the basement of Physics building. The general museum is housed

on the top floor of Morrill Hall. The insect collections are kept in proximity to the entomological laboratories. In them are found many types, including those of the collections of Van Duzee and of Osborn and Ball.

**THE INSECTARY** is a two-story fireproof building, connected with a greenhouse, outdoor screened house laboratory, and outdoor cellar for study of subterranean and hibernating insects. The greenhouse is divided into six compartments, each equipped with thermostatic temperature control. The main building contains small laboratories, a constant temperature room, and offices. Constant temperature and humidity chambers, water baths, and microscopes are available for research work. The building is equipped for life history, insecticidal, ecological, and physiological studies of insects. Adjacent land is available for plot experiments in insect control.

**THE APIARY FARM** of ten acres is located a short distance southwest of the campus. The equipment includes laboratory and storage buildings, test plots for forage, student apiaries and the experimental apiary. The laboratory contains a model honey house and facilities for instruction. The test plots offer opportunity to study the availability of nectar and pollen for bees.

**THE ARMORY** is a fireproof structure, constructed of tile and brick with heavy steel arches, gypsum ceiling and tile roof.

In addition to the drill floor, the building contains an indoor rifle range and pistol range as well as storerooms for clothing and equipment, and a mechanic shop for the repair of motor vehicles and guns. Offices and classrooms for all military classes are also provided in the building.

**THE MILITARY STABLES**, of brick construction, are of the latest military type, suitable for about ninety horses. These stables contain saddle rooms for riding equipment.

Within the stable area is also a horseshoeing shop and saddle shop, in addition to a lecture room, office, and quarters for the enlisted members of the Military Detachment.

A riding inclosure, giving ample room for equitation is located adjacent to the stables.

An excellent drill ground of about eight acres also adjoins the stable area. Facilities are provided for all mounted instruction, including the equitation and mounted drill for a Field Artillery Unit.

**GYMNASIUM.** This building is equipped for basketball, indoor baseball, volley ball, and handball, and has a gallery running track with twelve laps to the mile. The lower floor is of soil and cinders and is used for general exercises, field and track work, and team practice. The building is equipped with a swimming pool, general and team locker rooms. (Below the stadium are six handball courts, wrestling rooms, and dressing rooms.)

In addition to the gymnasium, the department has at its disposal an athletic field containing ten acres directly south of the gymnasium; a playground to the north of the gymnasium of about thirty acres; and the old athletic field containing about seven acres. These fields are fitted out for football, basketball, soccer, tennis, track, and field work. A tract of 150 acres adjacent to the Main Campus has been set aside as a recreational area and is in the process of development. A four mile bridle



path, a polo field, a cross country course, an eighteen hole golf course, and facilities for canoeing are under construction.

**MUSIC HALL**, a brick building formerly known as "The Maples," an example of the usage of English domestic architecture of the Elizabethan period, is located in the south central part of the campus. It contains the studios and offices of the Music Department as well as practice rooms, a lecture room, and a room containing the practice clavier for study of carillon.

**THE THEATRE WORKSHOP** is a circular wooden building containing a studio used by the Department of Public Speaking as a workshop for the Iowa State Players, the student dramatic club, and as a laboratory for classes in play production.

The Workshop has an area of unobstructed floor space, and is adapted and equipped for the construction and painting of scenery, the construction of properties, the making of costumes, experimentation with stage lighting, and the rehearsal of plays in their settings. Occasional private performances are given in the Workshop, which provides space for a fair-sized stage and audience.

The Workshop houses all of the equipment of the Iowa State Players, which is thus available for demonstration in courses of play production.

## DIVISION OF VETERINARY MEDICINE

The buildings of the Veterinary Division are arranged in a quadrangle surrounding an open court; the administration, hospital, and various departmental buildings are connected by corridors. The buildings are of brick and terra-cotta with climbing vines lending natural beauty to the architectural symmetry of the structures.

**THE VETERINARY ADMINISTRATION BUILDING** is the main building of the group. Here are located the Dean's offices, faculty room, offices of the departments of Medicine, Obstetrics, and Surgery, and an auditorium for assembly purposes.

**THE VETERINARY ANATOMY BUILDING** contains laboratories, an amphitheatre classroom and well-lighted dissecting rooms with all the apparatus and exhibits necessary for the work.

**THE VETERINARY HOSPITAL** contains hospital stalls, kennels, etc., for the housing of the patients. Operating rooms, dispensary, clinic, and lecture rooms are all well lighted and adapted especially to the needs for which they were designed.

**THE VETERINARY PATHOLOGY BUILDING** comprises two offices, a laboratory for research work, a large classroom, and a large general laboratory in connection with which are pathology preparation rooms, sterilizing room, an incubating room and diagnostic laboratory.

**THE VETERINARY PHYSIOLOGY AND PHARMACOLOGY BUILDING** contains offices, modernly equipped laboratories, a large classroom, a private laboratory and dark room, experimental animal rooms, and various technical apparatus and exhibits.

**THE CHARLES HENRY STANGE MEMORIAL CLINIC BUILDING** completed in 1937 is built in the form of a quadrangle, with a two-story front facing

south, 210 by 40 feet; a cattle clinic wing on the east, and a horse clinic wing on the west, each 200 by 40 feet; with a connecting wing on the north containing stalls, post mortem rooms, and garage. The first floor of the two-story unit contains operating rooms, pharmacy and service rooms for large animals; the second floor, similar rooms for small animals.

THE VETERINARY RESEARCH INSTITUTE is located on a farm of sixty acres, one mile south of the campus. An adequate laboratory building of brick construction and six barn units furnish room for the various phases of research work in progress. In cases of emergency, the Institute could readily be turned into a factory for the manufacture of biological products to control animal diseases.

### THE COLLEGE LIBRARY

The College Library is designed primarily to serve the needs of the faculty and students of Iowa State College in their research and study. Its facilities, however, are available to all citizens of the state, who are at liberty to write or apply in person for any information which can be answered through the collection of the library. Books on scientific and technical subjects may be borrowed, in certain cases, by any citizen in the state, the borrower paying the cost of transportation. Reference inquiries will be gladly answered, the advice of experts of the College being obtained when necessary.

The building was opened for the use of the public in the spring of 1925. A reading room with 300 seats and a shelf capacity of 18,000 volumes is on the second floor near the delivery desk and card catalog. On the first floor near the entrance are two rooms with a capacity of 150 seats each, one for newspaper and periodicals and the other for assigned reading.

For graduate students and faculty members, cubicles or small compartments with desks are provided in the stacks. Small private offices permit the use of typewriters and dictation without interference with other readers.

The library collection consists of about 250,000 selected volumes. Special emphasis has been given to the acquisition of sets of periodicals and society publications. The library is receiving currently over 5,000 periodicals and serials, principally in English, French, and German, although nearly every language is represented. The collections in the library adequately represent the specialized research work of the College.

**REGULATIONS.** The general library is primarily for free reference use; any student or citizen of the state may use the books in the reading rooms. The privilege of drawing books for use outside the building is available to all members of the instructing force, to all registered students, and to other accredited persons. Books not reserved and not in great demand may be borrowed for home use for two weeks and may be renewed for an additional two weeks if not needed by other readers. All books are subject to recall at any time.

General reference books, all general periodicals and certain other groups of books are to be consulted in the reading rooms only.

Books from the stacks which are not returned on time are subject to a fine of 2c a day before and 5c a day after notice has been sent out that the book is due. Books from the reserve shelves are subject to a fine of 25c for each hour kept overtime.

Books recalled for college work must be returned at once upon receipt of the notice. All books lost or damaged must be paid for.

**HOURS OF OPENING.** The general library is open Monday to Friday during the general sessions of college from 7:45 a. m. to 10:00 p. m., on Saturday from 7:45 a. m. to 6:00 p. m., and on Sunday from 2:00 to 6:00 p. m. During the Summer Session the library is open from 7:45 a. m. to 9:30 p. m., but is not open on Sunday. During vacation the library is open from 8:00 a. m. to 12:00 m. except on Sundays.

The library is regularly closed on Thanksgiving and Christmas days, but is open for certain hours on all other holidays.

## PERSONNEL SERVICE

M. D. HELSER, Director of Personnel for Men

FRANCES A. SIMS, Director of Personnel for Women

WALLACE E. BARRON, Assistant Director of Personnel for Men

Divisional Personnel Officers: Agriculture, R. M. Vifquain; Engineering,

L. O. Stewart; Home Economics, Dean Genevieve Fisher; Industrial

Science, G. M. Fuller; Veterinary Medicine, Dean Chas. Murray

The Personnel Service was organized at Iowa State College as a service department for the benefit of the students, the alumni, the faculty, and all organizations and individuals interested in employing either students or alumni. The personnel officers endeavor to serve the students and alumni as indicated below.

### I. STUDENTS.

**A. RECORDS.** Complete information is secured from each entering student concerning his family, high school record, and practical experiences. Five references, including personality ratings from high school teachers and family friends, are required. A psychological examination is given by the Psychology Department. This information is assembled on the personnel record card and given to the student's counselor.

During the residence in college complete and detailed information concerning the student is added to his preliminary material. The final record thus contains a composite of the student's personality ratings, and all other useful personnel information.

**B. COLLEGE ADJUSTMENT.** Twenty-five counselors have been appointed from the faculties of the various divisions to advise freshmen and sophomore students. On entering college each student is assigned to one of these counselors, who, under the direction of the Dean of the Junior College, will aid him in making his adjustment to college life. When the student enters the junior year he is assigned to a senior college counselor who is a member of the department in which the student expects to do major work.

A student failing to make the scholastic average expected of him is interviewed by one of the personnel directors and the head of the de-

partment in which he is majoring. Methods of improvement are suggested and the student's later progress is carefully followed.

**C. OCCUPATIONAL INFORMATION.** Staff members assist the counselors and personnel officers in furnishing information concerning the various vocations. An attempt is made to assist the student in choosing a vocation to which he is adapted.

**D. PERSONAL DEVELOPMENT.** One of the chief functions of the service is to assist the student in the improvement of his personality. Every personnel officer is ready to help the student in developing those traits of character that will not only create a favorable impression but also contribute to his usefulness in later life.

**E. EMPLOYMENT.** This Service co-operates with other agencies in making every effort to assist students in finding part-time employment.

A very important phase of the work of the personnel office is the assistance to seniors in securing proper employment upon graduation. Information on file regarding industrial concerns employing seniors after graduation assists greatly in the proper placement of seniors.

**F. RESEARCH AND TEACHING.** Special personnel studies are conducted from time to time by the personnel officers. Courses in personality development and personnel administration are taught at the College.

**II. ALUMNI.** The personnel officers assist the alumni of Iowa State College by supplying information concerning positions available. Any alumnus interested in securing employment or in changing his position may write to the personnel service for assistance. A special effort is made to keep in touch with the alumni and assist them in every way possible.

## STUDENT HEALTH SERVICE

JOHN G. GRANT, M.D., Director

Assistants, James F. Edwards, M.D., Sara B. Kalar, M.D., A. N. Schanche, M.D., Lee E. Rosebrook, M.D., Fern A. Goulding, R.N.

The college recognizes that the development of the body and the establishment of good health standards should go hand in hand with the development and training of the mind. To this end it has established the Student Health Service in the department of Hygiene, whose chief functions may be outlined as follows:

1. Health Examination of all students in order that the health status of each one may be determined and that advice and remedial measures may be applied, for the purpose of enabling the students to receive the greatest benefit both during their college years and in after life.

All new students are required to fill out a health history statement sent to them by the registrar and, upon admission, are given an examination by the medical staff.

This is followed up with advice, instruction and treatment of those students showing physical defects or health impairments, and the Health Service is able to keep many students in school with improved health conditions, who otherwise would fail to get the most out of their college course.

The close co-operation between the student health service and the departments of physical education makes it possible to correct many physical defects by prescribing proper exercise and to prevent the possible ill effects of too strenuous exercise for such as need carefully supervised physical training.

All graduating students are also given a thorough physical examination and advised regarding the maintenance of good health after they leave college. This advice is given after consideration of the student's health at time of the examination, his or her health history while in college, the occupation into which the student is about to enter, and the advisability of periodic health examinations in the future.

**II. HEALTH INSTRUCTION.** In addition to scheduled work outlined in courses of instruction under the Hygiene Department in this catalogue, the health service utilizes its many contacts with students to emphasize the importance of good health and to help them in solving their individual health problems.

**III. MEDICAL AND SURGICAL SERVICE** in cases of sickness or injury. In order to furnish complete medical care and advice for sick students as promptly and conveniently as possible, the college has provided a well equipped modern hospital and dispensary needed both for the care of students with conditions requiring hospital service and for attention to the lesser ailments that can be cared for in the dispensary without hospitalization.

All students who pay the full registration fee are insured medical and routine nursing service by the college medical and nursing staff in case they come to the hospital or dispensary. Medicines and service such as x-ray may be supplied on a cost basis.

The following regulations apply to the privileges of the hospital.

1. Students entering the hospital will be given three days' service without charge. For all time in excess of three days per college year, the student is charged at the rate of \$2.00 a day to cover board, room, light and heat. Faculty and other college employees or members of their families may be admitted, at the discretion of the college physician, at cost of hospitalization.

2. In case a special nurse or physician is employed, the expense shall be borne by the particular patient, the selection of such a nurse or physician to be approved by the college physicians.

**IV. SANITATION OF STUDENTS' ENVIRONMENT.** The sanitary conditions surrounding the college are excellent. They are supervised by the Public Health committee of the Faculty co-operating with the Department of Hygiene.

The college has its own excellent water supply. The college buildings, students' quarters and surroundings are kept under sanitary surveillance.

**V. PREVENTION OF INFECTIOUS DISEASES.** An important part of the work of the Health Service is the prevention of epidemic diseases.

All such cases are isolated and contacts with them are kept under such supervision as may be required in accordance with modern epidemiological methods.

The President and the college physician may require of students entering the College a certificate from a reputable physician showing success-

ful vaccination. It is strongly urged that all students entering Iowa State College be vaccinated before leaving home. This is recommended in order that valuable time may not be lost during the college year by the necessity of being vaccinated.

The college physicians are authorized to exclude from the dormitories and recitation rooms any persons afflicted with a contagious disease, and in case of necessity, contacts with such cases.

## RELIGIOUS LIFE AT THE COLLEGE

RELIGIOUS SERVICES are held once each month on Sunday nights and are addressed by prominent clergymen and other religious speakers. An attractive feature of these services is the music by a large chorus choir and by other musical organizations on the campus. During the summer session vesper services are held each Sunday.

RELIGIOUS EMPHASIS WEEK is set apart each year in January. Discussions are carried on in dormitories and organized houses. A speaker of national reputation is secured for a convocation address and to speak on other occasions to faculty and student groups. The final service is held on Sunday night with all church groups co-operating.

THE CESSNA LECTURES have been established as a means of perpetuating the spirit and ideals of Dr. O. H. Cessna, a graduate in the Class of 1872 and Professor and College Chaplain from 1900 to the time of his death in 1932. The general theme of the lectures is Philosophy and Religion.

THE STANTON MEMORIAL CARILLON is very much at the heart of the College religious life. Great hymns of the church are played each morning during the fifteen minutes preceding the opening of classes. For many, this period becomes a time of meditation and devotion.

YOUNG MEN'S AND YOUNG WOMEN'S CHRISTIAN ASSOCIATIONS. These two organizations are quartered in Alumni Hall on the campus, where parlors, reading rooms, game rooms, service counter, etc., are provided. The room and employment service for men is handled through the Y. M. C. A. Both associations carry on a varied and vigorous program of religious group meetings, discussion groups in houses where students room, and many other activities tending to build up the moral and spiritual life of students. Special emphasis is given to freshman work. The purpose is not only training for future leadership in religious work but the larger one of challenging potential possibilities in every freshman. The two associations are rated as among the leading organizations of this kind in the United States.

COLLEGE PASTORS AND CHURCH WORK. All Ames pastors and churches maintain special work for students. There are ten denominations represented and students find unusual opportunity for worship, participation in church school, young people's work, religious dramatics, recreational and social life, and other forms of religious effort. Five denominations have developed special plants and equipment adjacent to the campus to care for this work.

DIRECTOR OF RELIGIOUS LIFE. Through this office the College maintains a direct touch with the work that is being carried on through the

religious organizations. Courses in Religious Education are also provided and much time is spent in personal conferences and in the correlation and direction of religious activities in such a way as to be helpful to the entire faculty and student body.

## FRATERNITIES AND SORORITIES

A number of fraternities and sororities have established chapters at Iowa State College with the approval of the college authorities. These groups are subject to rules which have been worked out jointly by these organizations and the faculty. They co-operate with the college in the improvement of scholarship, in the molding of character, and in the all-around development of their members.

Pledges may be formally initiated after two quarters of attendance during which they have earned at least 28 quarter credits with an average standing of not less than 1.5 quality points per credit, 27 quarter credits with an average of 1.75 quality points, or 26 quarter credits with an average of 2.0 quality points.

The nine national sororities provide accommodations for approximately 230 women. All freshman women are required to live in the dormitories for one year. The average cost of living in a sorority house is \$45 a month for each member. This amount pays for board and room, chapter dues, and social obligations. The average initiation fee is \$50.

The twenty-nine social fraternities provide homelike surroundings and wholesome food for approximately 900 men. First year students who are invited to join may live in fraternity houses. During the past school year, the monthly expenses of members varied from \$35 to \$50, which included board and room, dues, and social functions. The initiation fee varies from \$15 to \$60.

## THE WARD SYSTEM

The "Ward System" is an organization for men living outside of dormitories and fraternities. It offers its members the opportunity to participate in group activities, both social and athletic. By taking active part in a Ward group, every man in this organization may get the experience necessary for developing qualities of leadership and social poise, and may benefit permanently through acquiring a proper group spirit and co-operative attitude, as well as profit from the healthful recreation of team play and social activity.

There are 13 Wards of the residence area, each having at least 100 men residing within its boundaries. The business of each Ward group is handled in meetings conducted by its own organization and officers, a faculty man serving as advisor only. In these bi-monthly meetings a complete program of social affairs and athletic contests is sponsored and developed.

All social activities, including dances, parties, and picnics, are under the general supervision of the college Director of Social Life. Athletic events, including touch football, basketball, softball, tennis, horseshoe, etc., are under the supervision of the Director of Intramural Athletics.

The meetings and athletic events are open to all. Admission to the social events is by a Ward ticket costing one dollar for the entire year.

This fee, which is the only assessment made, is used to defray necessary expenses.

## ART ACTIVITIES

The Committee on Art serves as a consulting body concerning artistic affairs in the institution, and aims to create an environment in which students come to value art. Prominent among the activities of this committee are the selection, framing and hanging of pictures, both originals and reproductions, in the college buildings; statuary of merit is also acquired occasionally.

From time to time the Memorial Union, various departments, and interested student groups arrange for loan exhibits of works of art. Exhibitions sent out by the Iowa Artist Club, the Iowa Art Salon, and the Iowa Art Guild are regularly displayed in the Memorial Union. The directors of the Memorial Union Corporation annually arrange the Iowa Artists Dinner in honor of those whose work, coming from the Iowa Art Salon, is displayed in the Great Hall.

President Emeritus Hughes, with the assistance of the committee, was instrumental in securing for the College the mural paintings in the college library, executed under the direction of Grant Wood, as well as the sculptures of Christian Petersen in the Dairy Industry Building and its court. These works were done as part of the Public Works of Art Project. Later works of Mr. Petersen are groups in front of the Gymnasium and in the Veterinary Quadrangle.

## LECTURES AND ENTERTAINMENTS

The College offers a wide variety of concerts, dramatic entertainments, and lectures. The Artists' Course for 1936-37 includes such talent as the St. Louis Symphony Orchestra, the baritone Lawrence Tibbett, and the violinist Jascha Heifetz. The Old Globe Theater Players are the leading dramatic attraction. Among the lecturers are Senator Gerald P. Nye, Hugh Walpole, and Dr. Anton Lange, Jr.

Recently the College has adopted the plan of bringing to the campus certain speakers for several days of lectures and conferences. These speakers have achieved recognition both for their creative work and for their ability to present effectively the principles of appreciation. In 1936-37 the writer, Miss Zona Gale, Dean Charles F. Kelley of the Chicago Art Institute, and President Rudolf Ganz of the Chicago Musical College have been chosen to discuss their special interests. These series of informal lectures are meeting the personal needs of large numbers of students.

## DEBATING

The chief aim of debating at Iowa State College is to give students instruction and practice in public discussion. Under the direction of the Department of Public Speaking, the members of the debate squad each year participate in both intercollegiate and intra-mural debates upon questions of public interest. Iowa State College has a chapter of



Delta Sigma Rho, national honorary forensic society, and an active local debate organization.

## THE IOWA STATE PLAYERS

The Iowa State Players is the college dramatic club, sponsored by the Department of Public Speaking and directed by members of its staff. Each year the Players produce several full-length and one-act plays. These productions offer to students the opportunity to take part in the production of good plays, and to the college community as a whole the opportunity to see good plays. Some notable past productions have been: "Hell Bent for Heaven," Moliere's "The Miser," "Mr. Pim Passes By," "The Whiteheaded Boy," "Outward Bound," "Wings Over Europe," "The Cradle Song," and "The Bat."

## STUDENT PUBLICATIONS

The Iowa State Student is a tri-weekly newspaper published by a staff appointed from the student body. It is devoted to the news of the College.

The Iowa Agriculturist is an agricultural monthly magazine published by the students of the Agricultural Division, in co-operation with the Department of Technical Journalism.

The Iowa Engineer is published monthly by the students of the Engineering Division.

The Iowa Homemaker is a home magazine published monthly by the students of the Home Economics Division.

The Bomb is an all-college annual published by the students.

The Green Gander is a college humor quarterly published by Sigma Delta Chi and Theta Sigma Phi, student journalism societies.

The Ames Forester is an annual published by the Forestry Club.

Sketch is a literary magazine published once a quarter by undergraduate students interested in creative writing, with the co-operation of the Department of English.

Horizons is a quarterly magazine published by students of the Landscape Architecture Department.

These student publications are published at the College by The Collegiate Press, Inc., a printing plant owned by the publications.

## ALUMNI ASSOCIATION

The Alumni Association of Iowa State College was organized in 1876. Its purpose is to promote the highest interests of the institution and to increase friendship and sympathy among students and alumni.

The present officers of the association are:

President, Don B. Stouffer, '08, Council Bluffs, Iowa.

Vice-President, B. J. Firkins, '17, Ames, Iowa.

Recording Secretary, Norma (Lee) Merrick, '19, Ames, Iowa.

Treasurer, C. B. Murray, Ames, Iowa.

General Secretary, Harold E. Pride, '17, Ames, Iowa.

Editor, Wallace E. Barron, '28, Ames, Iowa.

The annual meeting and banquet are held commencement week.

Active local branches of the general association exist in all the principal cities of the United States and various counties in Iowa.

The ALUMNUS, the official organ of the association, appears monthly throughout the year. It is under the supervision of the general secretary.

The offices of the association are on the second floor of Memorial Union. Here all Iowa State men and women will find a hearty welcome.

# Admission To College

- (For admission to the Graduate College, see page 137)
- (For admission to Non-Collegiate Curricula, see page 342)

Each student entering college must be at least sixteen years of age, must make formal application for admission, and must present a certificate signed by the superintendent or principal specifying the branches of study and credits included within his high school course of study. The application for admission and the official high school transcript from each school attended should be filed with the Registrar at the close of the school year, if possible, and not later than the first Monday in September, December, or March. The Registrar will evaluate all credentials and will notify the applicant of their acceptance.

Applicants should write to the Registrar for the application for admission, for high school certificate forms, and for general information concerning admission. If the applicant has attended more than one high school, he should ask for a high school certificate blank for each school attended. Principals of Iowa high schools have a supply of these certificate blanks in their offices.

All credentials which are accepted toward admission to the college must remain permanently in the files of the Registrar.

In general, students may enter the Divisions of Agriculture, Engineering, Home Economics, and Industrial Science at the beginning of any quarter. Regular classes begin in September, and students are urged to enter at that time. Some freshman subjects are, however, begun in each quarter including the Summer Quarter. Those who wish to come at the beginning of the Winter or Spring Quarter should inquire from the Registrar whether entrance at that time is feasible in their cases. Admission to the Division of Veterinary Medicine is granted only at the beginning of the Fall Quarter.

**DEFINITION OF A UNIT.** The requirements for admission are stated in terms of units. A unit is defined as the equivalent of one high school subject satisfactorily pursued during one school year, at least thirty-six weeks in length, on the basis of five recitations a week, the course of study for which the student is registered requiring no more than four subjects or twenty recitation periods a week. The length of the recitation period shall be at least forty minutes. Laboratory periods shall be at least sixty minutes in length. A unit is equivalent to two high school credits.

**GRADUATES OF IOWA HIGH SCHOOLS.** A graduate of a public four-year high school in Iowa will be admitted without examination to such col-

legiate courses as he is prepared to pursue. A graduate of any private four-year high school, seminary, or academy approved by the Board on Secondary School Relations will be admitted on the same basis. For unconditioned admission, the student must present fifteen acceptable units distributed in accordance with the statement of Entrance Requirements by Divisions on page 104.

**GRADUATES OF HIGH SCHOOLS IN OTHER STATES.** Graduates of high schools accredited by the state universities, or by other state accrediting agencies in case there is no state university accrediting agency, will be admitted by certificate. High school graduates whose certificates would be accepted without examination by reputable colleges in the state in which they are located, provided these states have no accrediting system, will be admitted by certificate. Graduates of other schools will be required to take entrance examinations. The high school records of non-residents of the State of Iowa must average at least half-way between "C" and "D" on a four-letter marking system with "A" as the highest mark and "D" as the lowest passing mark. Applicants whose records do not meet this requirement will not be admitted.

**GRADUATES OF NON-ACCREDITED HIGH SCHOOLS.** A graduate of a private Iowa secondary school not approved by the Board on Secondary School Relations or of an unaccredited high school outside of Iowa may be admitted to a collegiate curriculum by the following plan.

- (a) He must pass entrance examinations in subjects representing each of the main groups of subjects certified, for one-third of the number of acceptable units so certified.
- (b) The subjects for examination are to be selected by the examiner irrespective of the choice of the student at the time of the examination.
- (c) The total number of units allowed on the certificate shall not exceed three times the number earned by examination.
- (d) The total amount of credit gained by examination and certificate must at least equal the requirements for admission as stated on page 104.

**NON-GRADUATES OF HIGH SCHOOLS.** A student who is not a graduate of an Iowa public four-year high school or a private four-year high school, academy, or seminary approved by the Board on Secondary School Relations, or a graduate of an accredited high school outside of Iowa, will not be admitted unless he presents at least fourteen acceptable units by certificate, by examination, or both certificate and examination. He will be conditioned to the extent of enough units to bring the total to fifteen. These units must be distributed according to the specified list of units found on page 104.

**CREDITS FROM ACADEMIES AND PREPARATORY SCHOOLS.** Credits certified from private secondary schools such as academies and seminaries, and from college preparatory schools will be estimated in accordance with the definition of the entrance unit and on the basis of four years of preparation and residence. College academies or preparatory departments conforming in their organization to the organization of the four-

year accredited high school will be treated as accredited schools if the colleges themselves are regarded as standard colleges.

**CREDITS BASED UPON TEACHERS' CERTIFICATES.** Entrance units may be granted upon the basis of a First Grade Uniform County Certificate for subjects marked 85% or above, as follows. Arithmetic,  $\frac{1}{2}$  unit; United States History,  $\frac{1}{2}$  unit; Physiology,  $\frac{1}{2}$  unit; Grammar,  $\frac{1}{2}$  unit; Civics,  $\frac{1}{2}$  unit; Economics,  $\frac{1}{2}$  unit; Algebra, 1 unit; Agriculture,  $\frac{1}{2}$  unit; Domestic Science,  $\frac{1}{2}$  unit; Manual Training,  $\frac{1}{2}$  unit; and for State Certificates when gained by examination, as follows: Second Grade 10 $\frac{1}{2}$  units; First Grade, 14 units; Life Diploma, 16 units.

**COLLEGE ENTRANCE EXAMINATIONS.** Students who desire to enter by examination and who present satisfactory evidence that they have made sufficient preparation will be examined in any subject required for entrance.

Entrance examinations will be given at the beginning of every quarter. See examination schedule on page 106.

Certificates of entrance examinations passed for admission to reputable universities and colleges, and certificates of examination passed under the direction of any of the College Entrance Examination Boards or the Regents of the University of the State of New York, will be accepted on the same basis as the certificates from the accredited schools of Iowa.

**ADVANCED STANDING.** Work of recognized merit which has been taken in colleges and universities of good standing will be credited for an equivalent amount of work in so far as it applies on any curriculum offered in this College.

College credits accepted from other colleges must average "C" on a four-letter marking system with "A" as the highest mark and "D" as the lowest passing mark. Non-residents of the State of Iowa will be denied admission unless their college credits average "C." For residents of the State of Iowa, courses marked "D" or an equivalent amount of credit in other courses will be rejected if necessary in order to bring the accepted credits to a "C" average. Such rejected credits may be "recovered" if the student makes a sufficiently high scholastic record in this College. Iowa residents whose averages are below "C" will be admitted on scholastic "probation."

At least one month prior to the opening of the quarter, each applicant should send to the Registrar an official transcript from each institution attended to ascertain the credit to be allowed. Such credits will be provisionally accepted. The final acceptance of the credits will depend upon the student's maintaining a satisfactory standing for one year.

Prospective students will be required to present a letter of honorable dismissal from the institution last attended, to file a formal application for admission, and to present an official transcript from each high school attended.

High school credit in excess of sixteen units may be converted into college credits only in case the student is able to pass a rigorous examination for college credit in a subject corresponding to the work of his curriculum.

**COLLEGE GRADUATES WHO DESIRE BACCALAUREATE DEGREES.** A graduate of any college of approved standing may be granted the degree of Bachelor of Science in any curriculum offered by the Division of Agriculture, Engineering, Home Economics, or Industrial Science, upon the completion of 108 quarter credits in residence, or, in special cases, upon the completion of such number of credits as may be fixed by the Committee on Advanced Standing.

The student must take all the required technical courses taught by the department in which he is classified and such other technical and non-technical courses as shall be specified by the head of the department and the dean of the division to a total of 108 quarter credits. This does not abrogate the rule that all specified prerequisites or their equivalents shall be met as determined by the Committee on Advanced Standing.

**CO-OPERATIVE PROGRAMS LEADING TO TWO DEGREES.** The College has co-operative agreements with other colleges and universities whereby a student may graduate from both institutions upon the completion of five years of work. Under this plan the student transfers to Iowa State College after having completed three years of study elsewhere.

Before transferring to Iowa State College a student must complete at least three years of work, securing thereby 135 or more quarter credits, 60 of which must be in science departments.

Such a student may then enter this College as a junior in the Division of Agriculture, Engineering, Home Economics, or Industrial Science and graduate from one of the various curricula offered in these divisions in approximately two years upon the completion of 108 quarter credits, or in special cases, upon the completion of a greater or smaller number of credits.

In all cases a student must take the technical courses required for the major work in which he is classified, and such additional technical and general work as may be required in the curriculum elected, but the maximum requirements usually will not exceed 108 quarter credits.

Any student who has decided to take the five-year curriculum under the co-operative plan, or who wishes further information concerning it, should write to the Registrar two years before transferring, or preferably at the time of entering college.

A plan has also been provided whereby students who complete the first three years in the curriculum in Industrial Science and subsequently complete the first year in a medical curriculum in a Class A medical college or the first year in a law curriculum in a recognized law college will be awarded the degree of Bachelor of Science from Iowa State College. By this arrangement the student can reduce to a minimum the time required to earn a Bachelor of Science degree from this College and a degree in medicine or law from another institution.

A similar plan provides for granting the degree of Bachelor of Science at the end of three years of residence in the Engineering Division of this College followed by one year of law in a recognized law college.

**SPECIAL STUDENTS.** To be classified as a Special Student in any of the curricula one must be at least twenty-one years of age, must give good

reasons for desiring such classification, and must furnish satisfactory evidence that he is thoroughly prepared to pursue the work chosen. Permission to take a special course and the subjects included therein must be secured from the Head of the Department in which the student seeks enrollment, the Dean of the Division, and the President of the College.

Permission to take a special program will not be granted to students until they have completed the freshman year of one of the curricula offered, and then only for a period not to exceed one year. Exceptions to the regulations requiring the completion of the freshman year, and to the rule limiting the special course to two years, including the freshman year, will be made in cases of persons of mature years who desire to take a particular line of scientific or technical work, and whose application to take such course is approved by the Dean of the Division in which the student seeks enrollment and by the President of the College.

The standard prerequisites for advanced work are subject to limited modifications with the approval of the Dean of the Division in which the student is classified.

GRADUATES OF APPROVED COLLEGES who are not candidates for a degree may take special work under the rules governing special students without having to complete the freshman year in any of the college curricula.

Classifications of such Special Students must bear the approval of the Head of the Department in which the student is registered, the Dean of the Division, and the President of the College.

IRREGULAR STUDENTS. Worthy students in good standing, over twenty-one years of age, not prepared to meet the entrance requirements of the freshman year, may be admitted without examination as Irregular Students, and may pursue college work not to exceed two years, provided:

1. That they give evidence of satisfactory preparation to carry such work successfully.
2. That they show good and sufficient reasons for not taking a regular course.
3. That they present a certificate covering their entire preliminary education.
4. That before registering as Irregular Students they obtain written permission from the Dean of the Division in which their major subjects are to be taken and from the President of the College. Such students will then be registered and classified the same as regular college students and will be subject to the same college rules.

ENTRANCE REQUIREMENTS BY DIVISIONS

	Division of Agriculture Units	Division of Engineering Units	Division of Home Economics Units	Division of Industrial Science Units	**Pre- Veterinary Year Units
*Groups—					
1 English -----	3	3	3	3	3
2 Foreign Lan- guage -----	0	0	0	0	0
3 Social Science --	1½	1½	1½	1½	1½
4 Mathematics					
Algebra -----	1	1½	1	1½	1
Geometry, plane	1	1	1	1	1
5 Natural Science	0	0	0	0	0
{ Additional re- quirements in the above groups 1, 2, 3, 4, and 5----- }	2½	2	2½	2	2½
Minimum total--	9	9	9	9	9
6 Miscellaneous---	6	6	6	6	6
Total units re- quired for ad- mission -----	15	15	15	15	15

\*For subjects included within Groups, see below.

\*\*For requirements of the Pre-Veterinary Year, see page 319.

†Dairy Industry and Chemistry, Forestry, and Landscape Architecture require 1½ units of algebra.

SUBJECTS REQUIRED OR ACCEPTED FOR ADMISSION

College entrance subjects are classified in the following six groups. The subjects included in these groups, the number of units acceptable in each subject, and other restrictions, are given below.

Group 1. ENGLISH.

The three required units in English must be selected from composition and rhetoric, literature, and grammar. College entrance credit for English grammar, not exceeding ½ unit, will be accepted but only provided the student accomplishes it in the 10th, 11th, or 12th grade. Additional work in English may include composition and rhetoric, literature, and not to exceed ½ unit each in business English, journalism, and public speaking.

Group 2. FOREIGN LANGUAGES.

A total of not more than 4 units will be accepted in any one foreign language. No credit will be given for less than one unit in any foreign language.

Greek

1 to 4 units



Latin	1 to 4 units
French	1 to 4 units
Spanish	1 to 4 units
German	1 to 4 units
Scandinavian	1 to 4 units

Group 3. SOCIAL SCIENCE.

Ancient History	$\frac{1}{2}$ to 1 unit
Medieval and Modern History	$\frac{1}{2}$ to 1 unit
English History	$\frac{1}{2}$ to 1 unit
United States History (No credit if taken before the tenth grade)	$\frac{1}{2}$ to 1 unit
General History	$\frac{1}{2}$ to 1 unit
Civil Government or Community Civics	$\frac{1}{2}$ to 1 unit
Economics	$\frac{1}{2}$ unit
Sociology	$\frac{1}{2}$ unit
American Citizenship	$\frac{1}{2}$ unit

Group 4. MATHEMATICS.

Elementary Algebra	1 unit
3rd Semester Algebra	$\frac{1}{2}$ unit
4th Semester Algebra (essential equivalent of college algebra)	$\frac{1}{2}$ unit
Plane Geometry	1 unit
Solid Geometry	$\frac{1}{2}$ unit
Plane Trigonometry	$\frac{1}{2}$ unit

Group 5. NATURAL SCIENCE.

Agriculture	$\frac{1}{2}$ to 2 units
Astronomy	$\frac{1}{2}$ unit
Biology, elementary	$\frac{1}{2}$ to 1 unit
Botany	$\frac{1}{2}$ to 1 unit
Chemistry, no credit given for less than	1 unit
General Science	$\frac{1}{2}$ to 1 unit
Geology	$\frac{1}{2}$ unit
Physical Geography or Physiography	$\frac{1}{2}$ to 1 unit
Physics, no credit given for less than	1 unit
Physiology	$\frac{1}{2}$ unit
Zoology	$\frac{1}{2}$ to 1 unit

Group 6. MISCELLANEOUS.

Six units may be accepted from whatever commercial, industrial, or non-academic subjects are counted toward graduation from the high school. Any subject such as physical training, music, glee club, band, etc., which is permitted in addition to four regular high school subjects is considered an extra-curricular subject. In special cases credit of not more than  $\frac{1}{2}$  unit per year in such extra-curricular subjects may be used toward admission, if counted toward graduation from the high school.

The following subjects are frequently presented in this group:

Arithmetic (No credit if taken before the tenth grade)	$\frac{1}{2}$ unit
Elementary Bookkeeping	$\frac{1}{2}$ to 1 unit
Advanced Bookkeeping	$\frac{1}{2}$ to 1 unit
Commercial Law	$\frac{1}{2}$ unit
Business Organization	$\frac{1}{2}$ unit
Commercial Geography	$\frac{1}{2}$ unit
Industrial History	$\frac{1}{2}$ to 1 unit
Salesmanship	$\frac{1}{2}$ unit
Stenography	$\frac{1}{2}$ to 2 units
Typewriting	$\frac{1}{2}$ to 2 units
Vocational Guidance	$\frac{1}{2}$ unit
Bible	$\frac{1}{2}$ to 1 unit
Music	$\frac{1}{2}$ to 2 units
Agriculture—additional units	$\frac{1}{2}$ to 2 units
Psychology	$\frac{1}{2}$ to 1 unit
Pedagogy and Methods	$\frac{1}{2}$ to 1 unit
Freehand or Mechanical Drawing	
Manual Training, i.e., Shop Work	
Home Economics	

**ENTRANCE CONDITIONS.** A student who is admitted with deficiencies may remove them by passing entrance examinations or by taking courses at the College. Credit earned in removing such deficiencies will not be allowed toward graduation.

Entrance conditions in specific subjects must be removed by registering for these subjects at the earliest opportunity. Such deficiencies must be removed before the student registers for his second year's work. Entrance conditions in elective subjects may be removed by taking extra college work before graduation. College courses so used will be credited toward admission at the rate of nine quarter credits as the equivalent of one high school unit.

Any student who enters with specific deficiencies or any student at least 21 years of age, who may be admitted as an Irregular Student, may be excused from making up any deficiency in the college entrance requirements, if he shows through Freshman Tests and through his first year (three quarters) of work undertaken in college that he is at least a C student. An exception to the foregoing is that specific deficiencies in high school mathematics can be removed only by examination or by taking the work in class.

A student admitted with conditions will not be permitted to remove these conditions by taking entrance examinations in subjects in which he has been taking college courses for credit.

If a student presenting the required entrance credit in a given subject fails to do satisfactory work in the succeeding college course he may be assigned to a review course. Such work will not be counted toward his degree.

**ENTRANCE EXAMINATION SCHEDULE.** Admission to the entrance examination is by permit which may be obtained from the Assistant Examiner, Room 105, Central Building.

The examinations will be given on September 23, 1937, January 1, 1938, and March 22, 1928, at the following hours.

**8 A. M. to 10 A. M.**

Algebra  
Plane Geometry  
Solid Geometry  
Physics  
Physiology  
Botany  
Physiography

**10 A. M. to 12 M.**

English  
History, American  
History, English  
Civics  
Economics  
Sociology

Any student finding a conflict in his program or requiring other entrance examinations should report to the Assistant Examiner for adjustment.

## **FRESHMAN DAYS**

Eleven years ago Iowa State college set aside a short period prior to the opening of the regular college year and designated it as "Freshman Days." These days are for the beginning student and serve a three-fold purpose: First, to provide an opportunity to induct the new student into the educational life of the College; second, to provide a time when certain tests may be given—the purpose of these tests being to furnish to those who are in charge of the counseling and guidance program of the institution such information as will be helpful in planning the student's program; and third, to provide time to register each student in the curriculum he has chosen.

All new undergraduate students, whether entering with advanced standing from other colleges or direct from high school, are required to be present and share in the program provided. Nothing should be allowed to interfere with the activities of these days. They start Thursday, September 23, 1:00 P.M., with the opening meeting in the State Gymnasium, and will continue to the following Monday night. President C. E. Friley will give the opening address, after which students will be organized into small groups under faculty leaders.

**HEADQUARTERS:** Freshman Days headquarters will be maintained in Room 3, Central Building.

**INVITATION TO PARENTS:** Parents of new students are cordially invited to visit the campus during Freshman Days. They are particularly urged to attend the opening meeting at 1:00 P.M. on Thursday, September 23, in the State Gymnasium, and the reception later the same afternoon for parents and students in Great Hall, Memorial Union. At the reception parents will have opportunity to meet President Friley, Dean M. D. Helser, and the counselors.

# **Fees and Expenses**

(Fees are subject to change without notice)

## **FEES**

**PAYMENT OF FEES:** All fees must be paid on registration day at the beginning of each quarter.

**MATRICULATION FEE:** Every student upon entering the college must pay a matriculation fee of \$10.00. Exception is made in case of all non-collegiate students. This fee is paid but once.

**REGISTRATION FEE FOR UNDERGRADUATES.** The registration fee for undergraduates, indicated below, covers the following fixed charges: laboratory fees, hospital service, use of library, membership in the Memorial Union, and incidentals; the fee also entitles the student to admission to athletic contests, concerts, lectures and debates, to subscription to the several student publications, and covers class dues of twenty-five cents a quarter.

	Fall	Winter	Spring
Division of Agriculture .....	\$36.00	\$36.00	\$36.00
Department of Agricultural Engineering....	38.00	38.00	37.00
Division of Engineering .....	40.00	39.00	39.00
Division of Home Economics .....	36.00	36.00	36.00
Division of Industrial Science .....	36.00	36.00	36.00
Division of Veterinary Medicine .....	40.00	39.00	39.00

Non-residents of the state, excepting those in Graduate College, must pay tuition in addition to the registration fee.

Irregular, Special, and Non-Collegiate Students pay the same registration fee as other students in the division in which they are enrolled.

**REGISTRATION FEE FOR GRADUATE STUDENTS.** The registration fee for graduate students covers the following fixed charges: laboratory fees, hospital service, use of library, membership in the Memorial Union, and incidentals.

	Fall	Winter	Spring
Graduate College .....	\$32.00	\$32.00	\$32.00
Graduate College, staff members .....	12.00	12.00	12.00

By paying \$4.00 in addition to the above registration fee each quarter, graduate students will be entitled to admission to athletic contests, concerts, lectures and debates, and to subscription to the several student publications.

For Summer Session fees, see page 354.

**TUITION:** In addition to the Registration Fee, all students who are non-residents of Iowa, except those in the Graduate College, will be charged tuition as follows.

Fall Quarter .....	\$14.00
Winter and Spring Quarters, each .....	13.00
Each Term of the Summer Quarter .....	7.00

Non-resident tuition will not be charged to students who have been residents of Iowa six months previous to their admission.

Students who return to college at the close of a regular vacation will not be considered to have changed their legal residence from the standpoint of assessment of non-resident tuition. But a student who remains out of college six months or more and gains a legal residence in Iowa will not be required to pay tuition when he re-enters college.

No person shall be considered by any conduct of his own while he is a student in the College to have gained or lost a residence in this state

for the purpose of registering in the College. But persons whose legal residence follows that of other persons, as hereinafter provided, shall be considered to have gained or lost legal residence in this state for such purpose while students in the College according to changes of legal residence of such other persons, except that such legal residence shall not be considered to be so gained until six months after such other person becomes a legal resident of this state.

The residence of minors shall follow that of the legal guardian, regardless of emancipation; but in case a resident of Iowa is appointed the legal guardian of a non-resident minor, the legal residence of such minor for the purpose of this rule shall not be considered to be established in the State of Iowa until the expiration of six months after such appointment.

Aliens who have taken out their first citizenship papers and who have been residents of Iowa for the six months preceding the date of their enrollment in the College will be regarded as eligible for registration as residents of Iowa.

The burden of registering under proper residence is placed upon the student. If there is any possible question of his right to legal residence, the matter should be brought to the attention of the Registrar and passed upon previous to registration or the payment of fees.

Non-resident tuition is payable in advance at the beginning of the quarter. If for any reason an error is made at the time of registration and a non-resident fee is afterwards assessed against the student, this fee must be paid within thirty days after date of such assessment or the student's registration in the College will be cancelled.

**FEES FOR LIGHT CLASSIFICATION:** Students taking less than the usual schedule pay at the following rates per quarter credit: Engineering, Veterinary Medicine, \$3.75; all others, \$3.25. The minimum charge is \$10. By an additional payment of \$4.00 per quarter, students will be entitled to admission to athletic contests, concerts, lectures and debates, and to subscription to the student publications.

**LATE REGISTRATION:** An undergraduate student who does not complete his registration and classification on the regular registration days will be required to pay \$2.00 extra if he registers on the day following the last registration day. For each day thereafter \$1.00 is added. The maximum fine is \$10.00.

A graduate student who does not complete his registration and classification by noon of the Saturday following the regular registration days will be charged a late registration fee as follows: If he registers on the following Monday, the fee is \$2.00. For each day thereafter \$1.00 is added. The maximum fine is \$10.00.

This fine does not apply to students entering for the first time.

**REGISTRATION FEE FOR PERIODS LESS THAN A FULL QUARTER.** Students who register for less than a full quarter will be charged at the rate of 10% of the registration fee for each week during the first five weeks of attendance of the regular college session. The minimum charge will be \$10.00. The full Registration Fee will be charged to those who attend six weeks or longer.

**WITHDRAWAL FROM COLLEGE:** If a student severs his connection with the College, he shall obtain from the Registrar, Room 107, Central Building, an Order to Settle. The College will refund the unused portion of the registration fee, deducting 10% for each week of attendance. No refund is made if the student has been in attendance six weeks or longer.

**GRADUATION FEE** The fee for graduation is \$15; for certificates, \$3.

**HOODS FOR DEGREE, DOCTOR OF PHILOSOPHY:** Candidates for the degree of Doctor of Philosophy will be required either to purchase or to rent hoods to be used at the time the degree is conferred. Hoods are to be secured through the Registrar.

**TRANSCRIPT OF RECORD:** Any person who has attended the College is entitled to a certified statement of the work he has completed. His transcript will be sent without charge to the Registrar of another college or to a prospective employer. A fee of \$1 will be charged for each additional copy.

## BOARD AND ROOM

**BOARD AND ROOM FOR WOMEN:** All young women are required to secure rooms through the office of the Director of Residence and to live in residence halls unless special arrangement is made through that office. About 750 young women can secure rooms in college residence halls. Rooms are furnished with beds, mattresses, rug, chairs, table, and dresser. Students must furnish bedding and such other articles as they need.

The price of rooms in the residence halls is \$32 per quarter for each girl. A few rooms with private bath rent for \$60 per quarter for each girl. Each student is required to send to the Director of Residence a \$5.00 deposit for reservation of room. This deposit is forfeited unless request for cancellation is received before September 1st.

A fee will be charged for all who find it necessary to remain in a residence hall during the winter and spring vacations.

Young women rooming in residence halls are required to board in the dining rooms of their respective halls. The price of board is \$4.50 per week. (See note below.)

Two halls, Clara Barton and Alice Freeman, are run co-operatively. These halls house one hundred and sixty-five women. The residents, by spending one hour's time per day in general house work, are able to reduce the cost of board to about \$2.50 per week. (See note below.)

Address all correspondence concerning rooms to the Director of Residence, Room 104, Central Building.

**BOARD AND ROOM FOR MEN:** A faculty committee known as the Student Housing Committee supervises the housing of all students whether off or on the campus. The price of rooms outside the residence halls at present is as follows: where two occupy a room \$1.50 to \$2.50 a week for each occupant; where one occupies a room, \$2.50 to \$4.00 a week. Board, at the time this goes to press, may be obtained at from \$4.00 to \$5.25 per week. The price of room and board, therefore, ranges from \$5.50 to \$7.00 per week.

Information regarding rooms may be secured by addressing the Student Housing Committee for Men, Alumni Hall, Iowa State College, Ames, Iowa. New students are advised to secure their rooms before arrival.

Students who expect to join fraternities would do well to defer engaging permanent rooms until they determine whether they wish to live in a fraternity house. Each student must reserve a room before registering. Board may be arranged for by the student after reaching Ames.

For the information of students and others interested, the Student Housing Committee has prepared a standard set of rules for houses furnishing rooms to students. The Committee reserves the right to forbid students to room in houses which do not meet the standard requirements. Copies of the regulations may be obtained by applying to the Student Housing Committee for Men, Alumni Hall, Iowa State College, Ames, Iowa.

**BOARD AND ROOM FOR MEN IN RESIDENCE HALLS:** About 128 men can be accommodated in the Men's Hall which is located near the Men's Athletic Field.

Rooms are furnished with curtains, beds, mattresses, chairs, study tables and dresser. Students must furnish bedding, rugs and such other articles as they need.

The uniform price of rooms is \$32.00 a quarter for each man whether in a single or double room. Each man who wishes to reserve a room in the hall is required to send to the Director of Residence a \$5.00 deposit. This deposit is forfeited unless request for cancellation is received before September 1st. Room rent is paid by the quarter, and in advance, on registration day. A fee will be charged for all who find it necessary to remain in the hall during winter or spring vacations.

The Men's Co-operative Hall housing about one hundred eighteen selected upper-classmen affords an economical and home-like place in which to live. With the exception of the cooking the men living in the hall do all the general housework, which demands about one hour of time each day. The cost for the past year has been \$5.00 a week for room and board. (See note below.)

Address all correspondence concerning rooms to the Director of Residence, Room 104, Central Building.

**ROOMS FOR MALE FOREIGN STUDENTS:** A limited number of male foreign students may find accommodations in the International House. The uniform room rent is \$2.25 per week whether in a single or a double room. Meals are not served.

Each man who wishes to reserve a room in the International House is required to make a \$5.00 deposit for reservation of room. This deposit is forfeited unless a request for cancellation is received before September 1st. Room rent is paid by the quarter and in advance on registration day. Address all correspondence concerning rooms to Chairman of the Student Housing Committee, Room 104, Central Building.

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**Note:** Rising food prices may necessitate an increase in the cost of board.

# ESTIMATE OF NECESSARY EXPENSES FOR THE AVERAGE STUDENT DURING HIS FIRST YEAR IN COLLEGE

	Agriculture Men	Engineering Men	Home Economics Women	Industrial Science Men	Women	Veterinary Medicine Men
Matriculation Fee -----	\$ 10.	\$ 10.	\$ 10.	\$ 10.	\$ 10.	\$ 10.
Registration Fee -----	108.	118.	108.	108.	108.	118.
Books and Supplies ----	30.	*45	30.	30.	30.	45.
Board (36 weeks) -----	162.	162.	162.	162.	162.	162.
Room (36 weeks) -----	72.	72.	96.	72.	96.	72.
Gym. Suit & Towel Fee**	6.	6.	5.	6.	5.	6.
Military Shoes & Belt***	4.	4.		4.		4.
Total -----	\$392.	\$417.	\$411.	\$392.	\$411.	\$417.

\*Students who have drawing instruments and a slide rule may deduct from \$10 to \$15 from this figure.

\*\*At the beginning of the freshman year, each man will be required to purchase gymnasium equipment for approximately \$4.50 and pay a towel service fee of \$1.00. The price for uniform and supplies in physical education for women will vary from \$3.50 to \$6 depending on the course chosen.

\*\*\*Members of the R. O. T. C. will have their uniforms furnished by the government. Each student must furnish his own tan shoes of military pattern and a tan leather waist belt. The cost of these items will be approximately \$4. Students who are not members of the R. O. T. C. may receive information as to the prices of uniforms from the head of the Military Department.

Students who are not residents of the State of Iowa should add \$40 a year for tuition.

The above estimates do not include the cost of clothing, transportation, and incidentals. The student's general expenses in addition to the items listed above are subject to the personal habits of the individual and vary according to the degree of economy exercised.

Prospective freshmen should consider carefully the cost of the first year. No one should enter college unless he has money, in his own right, or from friends, to meet his expenses for the freshman year. If he is in debt at the end of the first year, he is certain to be seriously embarrassed during the remainder of his college curriculum. College debts should be met with the same business-like promptness with which one expects to meet other indebtedness.

Taking into consideration items listed above under "Necessary Expenses" it is questionable whether a freshman will be able to complete the first quarter, which is generally the most expensive, for less than \$150 to \$200. On arrival in Ames, a student should have about \$100 to meet the registration fee, matriculation fee, cost of books, equipment and gymnasium outfit, and the required advance payment for room and board.

For information concerning the employment of students see page 115.

Note: Fluctuations in food prices may necessitate changes in the cost of board.



## FEE EXEMPTIONS, LOANS AND SCHOLARSHIPS

Fee exemptions are granted only when the committee in charge is assured that:

1. Neither the applicant, nor his parent, is financially able to pay the full fee,
2. The applicant is of good moral character,
3. The applicant has scholastic ability as evidenced by good standing in one of the regular curricula at Iowa State College. A student is not eligible to the exemption until after he has completed at least one quarter here. An average of "C" or two quality points is required of students classified in the Junior College; Senior College students must have a 2.5 quality point average. Students must not have unremoved conditions or failures on their records. Exemptions are granted for one quarter only. Any misrepresentation will result in cancellation of the exemption and will make all former exemptions due and subject to payment.

For application forms, men should apply to the Director of Personnel for Men, 117 Central Building, and women to the Director of Personnel for Women, 119 Central Building.

Applicants for fee exemptions fall into two classes according to the location of their homes:

1. Residents of Iowa. This amounts to \$20 a quarter and is restricted to students whose parents are residents of Iowa.
2. Residents of states other than Iowa. A limited number of non-residents may receive an exemption of \$40 a year (\$14 Fall Quarter, \$13 Winter and Spring Quarters) which covers the out-of-state tuition.

**EXEMPTIONS FOR WORLD WAR VETERANS:** All honorably discharged soldiers and sailors of the World War who are citizens of Iowa shall be exempt from fees to the amount of \$40 a year, provided the present plan is continued by the next General Assembly of Iowa.

**LaVERNE NOYES SCHOLARSHIP FOR WORLD WAR VETERANS AND THEIR DESCENDANTS:** LaVerne Noyes of the class of 1872 left by his will a large portion of the income from his estate to be used in certain colleges and universities for assistance to students who served in the World War or to their descendants. The fund is administered by the trustees of the estate of LaVerne Noyes and is recommended only for students of good standing needing assistance.

Application for such scholarship at Iowa State College should be made to the Chairman of the Loan Committee.

**STATE FAIR BOARD SCHOLARSHIPS:** The State Fair Board offers scholarship prizes in this institution amounting to \$600, open to both collegiate and non-collegiate students in agriculture. These scholarships are awarded at the Iowa State Fair and are based upon boys' stock and grain judging contests. There are six scholarships, ranging from \$25 to \$175. The winners of the contest receive the money in monthly installments during the year of college work. The winners of the two \$25 scholarships may use them either for the Winter Short Course, or for the regular work in Agriculture. These scholarships offer opportunities for

young men to receive substantial aid toward paying the expenses of a college education; many excellent students have come to this institution by this means.

**LOAN FUNDS:** The following loan funds available to junior and senior students with good collegiate records are administered by committees of the faculty:

The Wattles Loan Fund.....(For Men)  
 Bachelor Debating Society Loan Fund.....(For Men)  
 International Harvester Loan Fund.....(For Men)  
 Quaker Oats Loan Fund.....(For Men)  
 Pullman Scholarships—(For Men in Agricultural Courses)  
 Julia McCulloch Smith Memorial Loan Fund\_(For Women)  
 Georgia White Loan Fund.....(For Women)  
 Catherine MacKay Loan Fund.....(For Women)  
 Harriet Newens Loan Fund.....(For Women)  
 Frances A. Sheldon Memorial Loan Fund....(For Women)  
 Faculty Women's Club Accommodation Fund (For Women)  
 George Edward Sokol Loan Fund...(For Men and Women)  
 Alumni Trust Loan Fund .....(For Men and Women)  
 Henry Strong Foundation.....(For Men and Women)  
 Cosmopolitan Club Loan Fund....(For Foreign Students)

The Alumni Trust Loan Fund has been augmented by gifts from:

The All Dormitory Council  
 The Cardinal Guild  
 Class of 1909  
 Class of 1914  
 Class of 1923  
 Professor H. J. Gilkey  
 Professor Nelson Horn  
 E. J. Kearney, '93  
 Irving Smith, '95  
 Professor F. V. Vilbrandt  
 Professor E. H. Wilmarth  
 The Iowa for Hoover Club  
 Jack O'Lantern Fraternity  
 Sigma Xi Fraternity

and loans from:

Fifty members of the college faculty  
 Agricultural Engineering Staff  
 American Association of University Women  
 Ames Business and Professional Women's Club  
 The Cardinal Guild  
 Engineering Council  
 Delta Phi Delta Fraternity  
 Dormitory Council  
 Epsilon Sigma Phi  
 Gamma Sigma Delta Fraternity  
 Horticulture Club  
 Iowa Homemaker  
 Phi Upsilon Omicron Fraternity

Pi Mu Epsilon Fraternity  
Poultry Club  
Sigma Delta Epsilon Fraternity  
Sigma Xi Fraternity  
Women's I Fraternity  
WOI Book Club.

In addition, the following organizations are also assisting students: Federated Women's Clubs, P. E. O. Society, Knights Templar, Rotary Club, various churches and other organizations.

Information regarding any of the above may be obtained from Maria M. Roberts, 104 Central Building.

**GENEVA SCHOLARSHIP:** The Faculty Women's Club contributes \$50 towards the expenses of a delegate to the Y. W. C. A. Central Student Conference at Lake Geneva. This fund is awarded each Spring Quarter to a sophomore student. Scholarship, accomplishment in Y. W. C. A. work, interest in general college activities, and personality are the points considered in making the award.

**HENRY STRONG FOUNDATION.** The Henry Strong Educational Foundation allots a certain amount of money each year for the making of loans to upper classmen. Candidates are recommended by our loaning officer or loaning committee. Interest at 4% accrues after graduation. All repayments are again credited back to Iowa State College for use in making additional loans. No loans can be made to students over twenty-five years of age.

**STORY COUNTY ALUMNI ASSOCIATION PRIZE:** The Story County Alumni Association will provide suitable recognition each year to the senior student receiving the highest honors in scholarship.

**JULIA McCULLOCH SMITH MEMORIAL AWARD.** A prize of \$25.00 is awarded to the senior woman making the highest average in scholarship during at least seven consecutive quarters preceding January 1st of her senior year, unless this student is also winner of the Story County Alumni prize in which case it shall be given to the senior woman having the second highest scholastic standing. The award is given only to a student who is unquestionably high in character, in initiative, and in intellectual attainment.

**A. A. U. W. FELLOWSHIP.** The Ames branch of the American Association of University Women offers an annual fellowship which includes tuition, board and room, to a foreign woman student.

**JOSTEN'S SCHOLARSHIP.** Members of our student body are eligible to compete for the Josten's National Art Essay Contest Scholarship, \$200; Josten's Iowa Art Essay Contest Scholarship, \$50.

## EMPLOYMENT FOR STUDENTS

**THROUGH COLLEGE FUNDS.** While many students do earn a part, no one should expect to earn all of his expenses while in residence at the College. In general, a student should carry little, if any, outside labor his first quarter of attendance, since his full energies are needed for adjustment to his new environment. In all cases, the heavy laboratory

work necessitates careful planning to prevent outside labor from interfering with studies. Many students reduce the number of credit hours carried and remain in college for one or two extra quarters in order to have time for outside labor.

Some college departments provide employment such as office work, caring for livestock, and helping in the dairy, greenhouses, orchards and shops, and students needing financial assistance should consult with their department heads about this work. This compensated labor furnished by departments is given by each to its own students and is eagerly sought. Compensated labor is awarded to the most faithful and meritorious students in each department. This labor is paid for according to its value to the College, but no student should expect to pay the main part of his expenses by labor while here. The College cannot furnish the work, and even if it could, the student's time is needed chiefly for study. However, many worthy and industrious students pay a considerable part of their expenses by labor; over \$50,000 is paid out by the College each year to students and graduate assistants.

The integrity, resourcefulness, and determination of students have developed a great variety of ways of self help.

An employment service for men is maintained by the College Y. M. C. A. The Director of Personnel for Women will confer with women students needing employment. Prospective students seeking information regarding opportunities for work at the College should correspond with these offices.

**THROUGH N. Y. A. FUNDS.** Iowa State College, during each academic year since February 1, 1934, has received a grant of funds from the Federal Government to be used for the employment of needy and able students.

During the present academic year, 1936-37, the National Youth Administration is making available to the College an allotment of \$7,335 a month. This money is being used to employ about 800 students at socially desirable work at the College and Experiment Station. Much of the employment, which in addition to being remunerative, is instructive, is given to underclassmen, who because they are not well acquainted in the college community find it difficult to secure other employment. A proportionate part of the allotted funds is used to give employment to graduate students.

This financial assistance will be available to students as long as the Federal Government continues to provide the College with an allotment of funds.

**THROUGH SUMMER WORK.** Certain department heads often are able to secure summer employment for their upperclass students. Often such positions afford practical work closely related to instruction given in the College.

## Classification and Standing

**JUNIOR AND SENIOR COLLEGE:** The Junior College includes all students in the freshman and sophomore classes; the Senior College, all students in the junior and senior classes.

**AMOUNT OF WORK:** The amount of work in each subject is expressed in credits. A credit represents one recitation (involving two hours of preparation) or one three-hour laboratory period or other combination of teacher contact and outside preparation involving a total of three clock hours per week for 12 weeks.

**NUMBER OF CREDITS:** No student may classify in more than the maximum number of hours allowed in his curriculum per quarter unless by his previous record he has shown exceptional ability. The student will be allowed to drop such extra work only upon permission of the classifying Dean; he may be required to drop it in case this or any other work in his schedule is being carried unsatisfactorily.

In general, students failing in any portion of a quarter's work will not be allowed to take full classification for the next quarter.

**CLASSIFICATION:** No student may be admitted to any class or dropped from it except by authority of the classifying officer.

**CONFLICTS:** Students may not classify in conflicting courses without the approval of the departments concerned.

**MARKING SYSTEM:** The following system is used by instructors in reporting grades to the Registrar: A, Exceptionally high; B, Superior; C, Average; D, Lowest passing mark; E, Condition; F, Failed; W, Withheld; X, Dropped. For graduate students the lowest passing mark is C. Graduate students may also be given the mark P, Passed, to indicate satisfactory progress in any course which cannot be more definitely evaluated at time of report.

**QUALITY POINTS:** For each hour of work assigned, the student receives quality points, according to the grade attained as follows: Grade A, 4 points; B, 3 points; C, 2 points; D, 1 point; E and F, 0 points.

**GRADUATION:** A student intending to graduate shall not be eligible if he lacks at the beginning of his last quarter more credits, not including "Conditions" or "Withholds," than the number in which he would be entitled to classify as determined by his average for the preceding quarter. A student shall not have the privilege of removing "Conditions" or "Withholds" or securing substitutions later than the middle of the quarter in which he is to graduate. No credits will be accepted after this date for any courses except those included in the classification of the current quarter.

An average of at least 2 quality points per credit in all courses taken is required for graduation.

**RESIDENCE REQUIREMENTS:** A candidate for a baccalaureate degree must have spent at least one year in resident study in this College and must have earned 45 quarter credits in residence during the last year of work for such degree.

**STUDENT ENGLISH:** Considerable skill in the use of the mother tongue is becoming more and more important. As a result, the College has adopted the policy of granting diplomas only to those students whose written and spoken use of the language measures up to a fair standard of clearness and accuracy. All students are required to take English composition throughout the freshman year and nearly all at least one

course in speech subsequently. After students have completed their required English, the responsibility for having them maintain acceptable language standards rests primarily with the Committee on Student English. Accordingly, the Committee's staff examines written work prepared by both undergraduate and graduate students for courses outside of the Department of English and counsels with the writers of unsatisfactory papers. With the co-operation of departmental and divisional advisers, students markedly deficient in writing ability are assigned to tutors or to additional courses in English. Students suffering from speech difficulties are directed to the Department of Public Speaking for remedial work.

**BACK STUDIES:** Students are required to classify in back studies at the earliest opportunity. Any exception to this rule must be for a good reason and must be approved by the classifying officer.

**CHANGING CURRICULUM:** If a student who has grades below D in more than 5 credits wishes to change from one curriculum to another, his request must be approved by a committee consisting of his counselor and the head of the curriculum to which he wishes to transfer. Junior college students must also secure the approval of the Dean of the Junior College. Senior college students must secure the approval of their divisional dean.

## Examinations in Back Work

For matriculated students, examinations in back work will be conducted at the opening of the Fall Quarter, on September 23 and 24, as follows:

### THURSDAY

#### 8 A. M. to 10 A. M.

Farm Crops	.	.	.	.	Room 307, Agricultural Hall
Mining Engineering	.	.	.	Room 102,	Chemical Engineering Building
Physics	.	.	.	.	Room 5, Physics Building
Zoology	.	.	.	.	Room 309, Science Building

#### 10 A. M. to 12 M.

Electrical Engineering	.	.	.	.	Room 231, Engineering Annex
Civil Engineering	.	.	.	.	Room 312, Engineering Hall
Mathematics	.	.	.	.	Room 221, Central Building
Forestry	.	.	.	.	Room 210, Agricultural Hall
Geology	.	.	.	.	Room 299, Chemistry Building
Veterinary Medicine	.	.	.	.	Veterinary Building
Vocational Education	.	.	.	.	Room 108, Agricultural Annex

#### 1 P. M. to 3 P. M.

Chemical Engineering	.	.	.	Room 102,	Chemical Engineering Building
Mechanical Engineering	.	.	.	Rooms 204 and 205,	Engineering Hall
Military	.	.	.	.	Room 2, Armory
Landscape Architecture	.	.	.	.	Room 1, Landscape Studio

#### 2 P. M. to 4 P. M.

Government	.	.	.	.	Room 303, Central Building
History	.	.	.	.	Room 303, Central Building
Psychology	.	.	.	.	Room 210, Central Building

FRIDAY

8 A. M. to 10 A. M.

Animal Husbandry	.	.	.	.	.	Room 116, Agricultural Hall
Ceramic Engineering	.	.	.	.	.	Room 110, Engineering Annex
Chemistry	.	.	.	.	.	Room 198, Chemistry Building
Horticulture	.	.	.	.	.	Room 210, Agricultural Hall
Industrial Arts	.	.	.	.	.	Room 201, Industrial Arts Building

10 A. M. to 12 M.

Architectural Engineering	.	.	.	.	.	Room 216, Engineering Annex
Botany	.	.	.	.	.	Room 212, Botany Building
Dairy Industry	.	.	.	.	.	Room 105, Dairy Industry Building
Economics	.	.	.	.	.	Room 208, Agricultural Annex
English	.	.	.	.	.	Room 18, Central Building

1 P. M. to 3 P. M.

Technical Journalism	.	.	.	.	.	Room 102, Agricultural Annex
Genetics	.	.	.	.	.	Room 318, Agricultural Hall
Home Economics	.	.	.	.	.	Home Economics Building
Theoretical & Applied Mechanics	.	.	.	.	.	Room 208, Engineering Hall
Public Speaking	.	.	.	.	.	Room 310, Central Building

2 P. M. to 4 P. M.

Agricultural Engineering	.	.	.	.	.	Agricultural Engineering Laboratory
Modern Language	.	.	.	.	.	Room 315, Central Building
Bacteriology	.	.	.	.	.	Room 105, Science Hall
Library	.	.	.	.	.	Library
Soils	.	.	.	.	.	Room 19, Agricultural Hall

For the Winter Quarter, examinations will be given on January 1, 1938, the hours being the same as given above. For the Spring Quarter, examinations will be given on March 22, 1938, the hours being the same as given above. For the Summer Quarter, examinations will be given on June 14, 1938, and July 21, 1938. Conflicts will be arranged by the departments concerned.

## Degrees

In the Divisions of Agriculture, Engineering, Home Economics, and Industrial Science, the baccalaureate degree conferred is Bachelor of Science. The degree of Doctor of Veterinary Medicine is conferred upon the completion of the curriculum in Veterinary Medicine. In the Graduate College the degrees conferred are Master of Science, Doctor of Philosophy, and Professional Degrees in Engineering.

## Undergraduate Thesis

Candidates for graduation in certain curricula are expected to present satisfactory theses unless other subjects are substituted. The subjects for theses are selected in consultation with the heads of departments.

The filing of undergraduate theses in the library is optional with the department heads concerned, in consultation with the Librarian.

# Division of Agriculture

DEAN KILDEE, Agricultural Hall, Room 123N

The Division of Agriculture is made up of all the departments in the College devoted to the various phases of technical and practical agricultural work. The work of these departments is closely related, and the purpose of all of them is to train men for better service in agriculture.

In addition to the training of research workers, teachers, extension workers, workers in all types of business, commercial and professional activities connected with Agriculture, and managers of specialized and large scale farm enterprises, the Division of Agriculture has as one of its objectives the training of young men for general farming and rural living.

The faculty of the Division of Agriculture is made up of the members of all the departments within the Division and representatives of the departments in other divisions whose work serves to prepare agricultural students for a better mastery of technical work in agriculture.

The departments in Agriculture are: Agricultural Economics and Rural Sociology (administered jointly with the Industrial Science Division), Agricultural Engineering, (administered jointly with the Engineering Division), Agronomy, Animal Husbandry, Dairy Industry, Genetics, Horticulture and Forestry, Landscape Architecture, Technical Journalism, Vocational Education.

The following curricula in Agriculture are offered:

Agricultural Economics and	Dairy Industry . . . .	p. 219
Rural Sociology . . . .	Dairy Industry and	
Agricultural Education . .	Chemistry . . . . .	p. 221
Agricultural Engineering .	Dairy Industry and	
Agricultural Journalism . .	Economics . . . . .	p. 223
Agriculture and Science . .	Forestry . . . . .	p. 240
Agronomy . . . . .	General Agriculture . .	p. 174
Animal Husbandry	Horticulture . . . . .	p. 275
Animal Husb. Group . . .	Landscape Architecture .	p. 290
Dairy Husb. Group . . .	Two-year Curriculum:	
Poultry Husb. Group . . .	Agriculture . . . . .	p. 176

(For Non-Collegiate Curricula, see page 342.)

These curricula afford the student opportunity for pursuing study along that line of agriculture, which he is especially suited to follow. The farm, as it is usually conducted, is a combination of many branches of industry; and these curricula are so arranged as to direct the student into that branch which will call forth and centralize his special ability, and at the same time will prepare him to meet successfully the peculiar difficulties of his chosen work.



In the curricula in practical and scientific agriculture, a wide field of study is open to our students. The national government endowment fund and annual appropriations for original experimentation and instruction in agriculture and the sciences related to this industry, supplemented by state aid, enable the College authorities to make the fields, barns, orchards, and gardens, laboratories of extensive and most practical investigation and instruction.

The Agricultural Experiment Station is bringing to light better methods of feeding, more remunerative systems of cropping, more valuable strains of fruits, crops, and livestock, more remunerative systems of marketing agricultural products, and other improvements. These investigations are studied by the students first hand, and through the system of student employment a number take an active part in carrying on the work of the Experiment Station. This arrangement gives to the students clearer insight into scientific methods and at the same time valuable, practical experience.

In addition to laboratory work at the College, students are encouraged to visit various commercial enterprises throughout the state. Farms, orchards, stock shows, and other commercial institutions that have proved themselves of particular merit are visited by students in company with specialists from the College.

The curricula in this Division are designed to teach the sciences that underlie practical agriculture, and sufficient English, literature, mathematics, history, and other supplementary subjects to sustain both scientific and practical agriculture and to develop the agricultural student to the level of the educated in other professions.

Special attention is given to improved methods in all the various operations of farming and farm building, in the use of tools and machinery, and in the management of all kinds of stock and crops. Instruction embraces not only the principles but also the practice of agriculture. The great practical value of the curricula is shown by the records of those students who have completed them and who have gone back to the farm; it is also shown by those who upon graduation have taken up the work of specialists as teachers or investigators. Such men are proving themselves leaders in their various lines.

Economic and social phases of agriculture no less than technical factors come in for careful attention in successful farming. Marketing, co-operative methods, farm management, and community organizations are made the basis of special four-year curricula for farm managers, marketing specialists, and community leaders. The College is seeking to render a much needed service by providing a thoroughly practical and scientific training for such work.

The Division offers exceptional opportunity to graduate students in Agriculture. The strong instructional staff and extensive equipment draw students from many states.

**TEACHING AND RESEARCH FELLOWSHIPS AND SCHOLARSHIPS.** There are about forty teaching and research scholarships, fellowships, and assistantships awarded annually in the Division of Agriculture to graduate students. Application should be made during the first or second quarter of the preceding year. For stipends and further details, see Fellowships and Scholarships, page 145.

**TUITION SCHOLARSHIPS.** For information, see Fee Exemptions, page 113.

**QUAKER OATS COMPANY SCHOLARSHIP.** The Quaker Oats Company, of Chicago, offers a special \$50 scholarship at the Iowa State College to the individual having the highest score in the crops judging contest at the Iowa State Fair.

**AGRICULTURAL JOURNALISM SCHOLARSHIP.** The John Clay Agricultural Journalism Fund provides an income which permits the award of a graduate assistantship in Agricultural Journalism.

**CHARLES LATHROP PACK PERMANENT FORESTRY PRIZE FUND.** This fund of two thousand dollars has been provided by Charles Lathrop Pack, President of the American Tree Association. The annual income from this fund is to be used for prizes in developing more effective writing and speaking among technical forestry students. The topics may deal with any forestry or closely related subject. There will be two first prizes of \$35 each and two second prizes of \$15 each. One first prize and one second prize will be available for award for the best essays submitted by students of the combined freshman and sophomore classes and another first and second prize of like amount for those submitted by upper classmen. The competition is open to all forestry students.

**GAMMA SIGMA DELTA-ALPHA ZETA SCHOLARSHIP PRIZE.** To encourage superior work and to reward the student for conscientious effort during his freshman year, the honor societies of Gamma Sigma Delta and Alpha Zeta are jointly offering a prize to the freshman student having the best scholastic record in the Division of Agriculture.

**GEORGE GUND ANIMAL HUSBANDRY SCHOLARSHIP.** This Scholarship of \$200 is given annually by Mr. George Gund of the Gund Realty Company of Cleveland, Ohio. It is awarded by the Animal Husbandry staff to the senior student majoring in Animal Husbandry, who as a junior, made the best record in scholarship, character, and initiative.

**RUSSELL I. KLOPP MEMORIAL.** Dr. Henry I. Klopp has established a fund in memory of his son, Russell I. Klopp, who lost his life shortly after graduation in 1923. The income of this fund, approximately \$20, is offered as a prize each year to the senior student in Horticulture who has made the highest average standing during his junior and senior years.

**GEORGE H. WALKER PRIZE.** This prize consists of the annual income of the permanent fund of one thousand dollars donated by George H. Walker of Boston, Massachusetts, one of the founders of the Walker-Gordon Milk Company. It is awarded annually to a senior in Dairy Industry or Dairy Husbandry who has made outstanding progress in the study of milk.

**ZIMMERMAN MEMORIAL PRIZE.** Mr. W. F. Zimmerman of Chicago has established a permanent fund in memory of his son, Herbert, an exemplary young man who lost his life through an accident while enrolled as a student in the Department of Horticulture. The income of this fund now not less than \$20, is offered as a prize each year to a superior junior horticultural student.

The award will be made on the basis of ability, scholarly attainment, character, and interest in affairs which are worthy the attention of students who are preparing themselves to do the best possible work as horticulturists and as citizens.

**RYERSON TRAVELING FELLOWSHIP.** Each year two distinguished senior students in Landscape Architecture and two in Architectural Engineering are selected as collaborative teams to compete with similar groups from accredited midwestern schools for the Ryerson Traveling Fellowship. The award is valued at \$1,500 for each winner, one Landscape Architect and one Architect, to be used for European travel and study.

#### CLUBS AND AGRICULTURAL ORGANIZATIONS.

Name	Time of Meeting	Place
Agricultural Council	On call	Room 109, Agricultural Hall
Agricultural Education Club	3rd Thurs., of mo., 7:15 p.m.	Room 232, Memorial Union
Agricultural Economics Club	On call	Fraternity Houses
Agricultural Journalism Club	Thurs., 11:00 a. m.	Room 107, Agricultural Annex
Alpha Zeta Fraternity	On call	Men's Lounge, Memorial Union
Block and Bridle Club	1st Thurs. of mo., 7:15 p.m.	Room 117, Agricultural Hall
Dairy Cattle Club	One meeting a mo. on call, 7:15 p. m.	Room 117, Agricultural Hall
Dairy Club	1st Thurs. of mo: 7:00 p. m.	Dairy Industry Assembly
Forestry Club	Bi-monthly, Th., 7:30 p.m.	Agr. Assembly, Agricultural Hall
Gamma Sigma Delta Fraternity	On call	
Horticultural Club	On call bi-monthly	Room 205, Plant Laboratory
Iowa Section, Amer. Society of Agronomy	2d and 4th Wed. of mo., 4:00 p. m. (from November to March)	Room 19, Agricultural Hall
Iowa Student Branch, Amer. Society of Agr. Engrs.	Weekly, Fri., 10:00 a. m.	Room 128, Agricultural Engineering Laboratory
Poultry Club	1st and 3d Thurs., of mo., 7:15 p. m.	Room 117, Agricultural Hall
Student Section, Amer. Society of Agronomy	2nd and 4th Thurs. of mo., 7:30 p. m.	Room 19. Agricultural Hall
Vistonian Club	Weekly, 11:00 a. m.	Room 1, Landscape Studio
Wenugana Club	On call monthly	Memorial Union

**HONORARY AGRICULTURAL FRATERNITIES.** There are two national honorary agricultural fraternities that have chapters at the Iowa State College, the Alpha Zeta, and the Gamma Sigma Delta. Eligibility to Gamma Sigma Delta is based upon scholarship, and character. Membership is limited to a group of high ranking seniors in the Divisions of Agriculture, and Veterinary Medicine, along with a limited number of graduate students in Agriculture and related sciences upon recommendation from heads of departments. Membership in Alpha Zeta is limited to the upper one-fifth of the Junior class and the upper one-fourth of the senior class in the Division of Agriculture, and selection is made on the basis of scholarship, character, and qualities of leadership.

**TAU SIGMA DELTA**, a national honorary fraternity in Architecture and Landscape Architecture. In the spring of 1930, Kappa Chapter of Tau Sigma Delta, honorary fraternity in Architecture and the Allied Arts, was founded at Iowa State College. This is strictly an honorary fraternity in the Fine Arts, the sole purpose of which is to honor exceptional

students. Selections are made from the highest ranking students in the departments concerned. Student and professional exhibits are held to encourage interest in high artistic attainment.

**AGRICULTURAL PUBLICATIONS.** The students in the Division of Agriculture, under the general supervision and direction of the Department of Technical Journalism, publish a monthly journal known as *The Agriculturist*. This publication has taken high rank in its class, and affords students an opportunity to get practical training and experience in agricultural writing. In addition, considerable of the most meritorious work of advanced students in Agricultural Journalism is used by the agricultural press and by daily and weekly papers.

The *Ames Forester* is an annual published by the Forestry Club. The students, with the assistance of the alumni working in the field, have made this an attractive publication of a technical character.

*Horizons* is a quarterly Landscape Architecture magazine published by the students of the Landscape Architecture Department.

**AGRICULTURAL PERSONNEL SERVICE.** The Agricultural Division, through its Personnel Office, supplements and co-ordinates the effort made by the departments to establish definite contacts with those industries, commercial organizations, and Federal and State agencies that employ men who have had technical training in any of the departments of agriculture. This service includes the assistance given the members of each graduating class, the alumni and former students who desire to change positions, and the undergraduates who temporarily drop out of college or who seek agricultural or commercial experience during vacation periods.

# Division of Engineering

DEAN AGG, Engineering Hall, Room 210

The Division of Engineering consists of all the College departments devoted mainly to technical engineering work, which are grouped for the purpose of co-ordinating their work and promoting its quality and efficiency. It was organized about 1898 and a dean of engineering was appointed in 1904.

The faculty of the Division of Engineering is made up of all the members of the staffs of the departments within the Division.

The departments in Engineering that offer work leading to undergraduate or graduate degrees, or both, are as follows:

Agricultural Engineering . . . . .	p. 170	Civil Engineering . . . . .	p. 212
Administered jointly with the Division of Agriculture.		Electrical Engineering . . . . .	p. 230
Architectural Engineering . . . . .	p. 188	General Engineering . . . . .	p. 245
Ceramic Engineering . . . . .	p. 197	Industrial Arts . . . . .	p. 280
Chemical and Mining Engineering . . . . .	p. 200	Mechanical Engineering . . . . .	p. 296
The following departments are organized for special services:		Theoretical and Applied Mechanics . . . . .	p. 317
Engineering Personnel Service . . . . .	p. 128	Engineering Extension Service . . . . .	p. 370
Engineering Drawing . . . . .	p. 237		
Engineering Experiment Station . . . . .	p. 362		

The Civil and Mechanical Engineering curricula were established in 1868 when the College first opened. Electrical Engineering was added in 1891, Mining Engineering in 1894, Ceramic Engineering in 1906, Chemical Engineering and Agricultural Engineering in 1909, Architectural Engineering in 1914, Industrial Arts in 1920, General Engineering in 1926, Theoretical and Applied Mechanics in 1931, and the Department of Engineering Drawing in 1935.

The Engineering Experiment Station is the research organization of the division, and the Engineering Extension Service is engaged principally in educational work away from the College, including short courses both on the campus and at various places around the state. It also provides a technical information service. The activities of these two departments are quite different in character from those of the teaching departments within the Division, but are closely co-ordinated with the regular collegiate instruction.

**ENGINEERING DEGREES.** The four-year curricula lead to the degree of Bachelor of Science, with mention of the specific course taken.

Co-operative five-year curricula have been arranged in co-operation

with several Iowa colleges. (See page 102). Each five-year co-operative curriculum leads to two degrees: First, Bachelor of Science or Bachelor of Arts; second, Bachelor of Science in Engineering.

Students who complete three years with at least 156 quarter credits in any engineering curriculum in this college and who subsequently complete the first year of the law curriculum in a recognized law college will be granted the degree of Bachelor of Science by this college upon transferring their law credits back to this institution and upon satisfying the quality point requirement. Those interested in such a combined curriculum should notify the Dean of Engineering early in their course so that a special program may be outlined.

Graduates in liberal arts from colleges of high standing usually can secure an engineering degree at the Iowa State College by about two years of addition technical work. (See page 102).

In addition to the undergraduate engineering work, graduate work is also offered by each of the departments in the Division.

The degree, Master of Science in Agricultural Engineering, Architectural Engineering, etc., is conferred upon the satisfactory completion of a year of resident graduate study.

The degree, Doctor of Philosophy, is conferred upon the satisfactory completion of three years of graduate study. The degree of Doctor of Engineering is conferred only as an honorary degree.

The professional engineering degrees of Agricultural Engineer, Architectural Engineer, Ceramic Engineer, Civil Engineer, Industrial Engineer, Electrical Engineer, etc., are conferred on the basis of successful engineering practice after receiving the Bachelor of Science degree in Engineering. (See page 144).

**SELECTION OF DEPARTMENT BY THE STUDENT.** For two quarters all engineering freshmen take identical work and do not classify for any particular field of engineering. At the beginning of the Spring Quarter of the freshman year the student will select the field in which he wishes to study and classify in the department he selects from the list which appears near the top of the preceding page. While it is expected that the student will have decided upon his field of engineering by the beginning of the Spring Quarter of his freshman year, he may, at the end of the freshman year change his curriculum with the consent of the Dean of Engineering and the Dean of the Junior College, subject to existing faculty rules and the following conditions:

The student may be required to make up those subjects required in the freshman year of the new curriculum, but not taken in the original curriculum; but in such cases, the studies taken in the original curriculum which are not required in the new curriculum may be applied toward graduation. Students may change to the curriculum in General Engineering up to the end of the sophomore year on a basis corresponding to that prescribed above.

**OBJECTIVES.** The purpose of each of the engineering curricula is to afford the student opportunity to secure the thorough, fundamental, and technical education which is necessary for professional work of the highest grade in engineering; and, in addition, insure the developing of those physical, mental, moral, and social qualities which are essential to high professional attainment. Many powerful college influences, in

addition to the regular instruction, contribute to this broader education of the student.

Personal contact is sought between the students and engineers of high attainments in the faculty through a system by which each student is assigned to a faculty counsellor who confers frequently with the student about his work.

The fundamental studies come mainly in the freshman and sophomore years, and include Mathematics, Chemistry, Physics, English, and Economic Science. Their importance to the engineer can hardly be over-emphasized for they are the foundation for the whole superstructure of his technical education.

Through the medium of instruction in a special course called Engineering Problems the engineering student is taught, even in his freshman year, to make direct application of mathematics and physics to typical engineering problems.

The technical studies occupy about 30 per cent of the engineering curricula during the freshman and sophomore years, and the greater part during the junior and senior years. The technical studies are of too great variety to be mentioned in detail here, but are fully explained in the description of the engineering curricula.

Besides the regular courses of the engineering curricula, other agencies contribute in an important degree to the professional education of the engineering student. Among the more important of these are the following:

**TECHNICAL LECTURES.** Throughout the freshman year all engineering students meet for technical lectures delivered by members of the engineering faculty and engineers who are engaged in professional work who are brought in for the purpose. These lectures constitute a general introduction to the nature of and opportunities in the engineering profession.

**ENGINEERING SOCIETIES.** General professional association and advancement are promoted by the activities of the student branches of the great national engineering societies, of which the following are represented: American Ceramic Society, American Institute of Electrical Engineers, American Institute of Mining Engineers, American Society of Agricultural Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Chemical Engineers, and Industrial Arts Society.

**THE ENGINEERING COUNCIL** is the governing body of the student organizations in the Engineering Division. The council is made up of delegates representing all the departmental student technical societies and directs certain activities that are carried out by the student body. Among these are the Engineering Carnival, in the fall; the Engineering Open House, every spring, and similar engineering social affairs. The council each year invites a few prominent engineers to visit the college and address the students on subjects of general interest to the profession.

**ENGINEERING SEMINARS.** Engineering seminars are a feature of the advanced engineering work and are common to practically all departments. In several departments the work is merged with that of the engineering societies.

**TAU BETA PI.** This national honorary engineering society maintains a strong local chapter, to which only the highest one-fourth (in scholarship) of seniors, the upper one-eighth of the juniors, and the sophomore having the highest average, are eligible for election. A feature of the work of the chapter is an annual address to the freshman and sophomore engineers by some prominent outside engineer.

**ETA KAPPA NU.** This is a national honorary electrical engineering fraternity maintaining a local chapter at the Iowa State College.

**THE IOWA ENGINEER.** The engineering students publish monthly during the college year an engineering journal called "The Iowa Engineer." Articles are contributed by engineering alumni, non-resident engineering lecturers, and members of the engineering faculty, as well as by the student editors and reporters. Engineering journals are becoming so numerous and important that experience on "The Iowa Engineer" staff is very valuable.

**OPPORTUNITIES FOR ENGINEERING GRADUATES.** The tremendous modern development of industry in the United States requires in normal times technically trained men in great numbers for supervisory and executive positions of the most responsible character as well as for purely technical work. It is forecast that future graduates in engineering will have ample opportunity for professional employment of an interesting and lucrative character.

**ENGINEERING PERSONNEL SERVICE.** The Engineering Division, through its Personnel Office, establishes definite contacts with those industries and commercial organizations that employ men who have had technical training in any of the departments of engineering. This service includes the assistance given the members of each graduating class, the alumni who desire to change positions, and the undergraduates who stay out of colleges for a time or who seek industrial experience during vacation periods.



# Division of Home Economics

DEAN FISHER, Home Economics Hall, Room 122

The Division of Home Economics consists of the departments of Applied Art, Child Development, Foods and Nutrition, Household Equipment, Home Management, Institution Management, Physical Education, Textiles and Clothing, and Home Economics Education. It is the aim of the Division to co-ordinate the work of these departments with the general cultural and scientific subjects so that a well rounded four-year curriculum is offered. Specialization is provided by major sequences in the several departments.

The Division of Home Economics offers the following curricula:

Applied Art . . . . .	p. 254	Home Management . . .	p. 266
Child Development . . .	p. 257	Household Equipment .	p. 268
Foods and Nutrition with major in:		Institution Management .	p. 270
Dietetics . . . . .	p. 260	Textiles and Clothing .	p. 272
Nutrition . . . . .	p. 261	Textiles and Chemistry .	p. 273
Experimental Cookery .	p. 261	Home Economics with major sequence in:	
Related Science . . .	p. 262	Extension . . . . .	p. 265
Home Economics Education	p. 264	Technical Journalism .	p. 274

(For graduate courses, see page 136.)

THE CURRICULA IN HOME ECONOMICS are planned to meet the needs of those who desire a good foundation in the study of subjects relating to the economic, artistic, scientific, and social problems of the home; of those who desire the work as part of a liberal education; of those who wish to teach in secondary schools or colleges; of those who wish to prepare themselves for other vocations in related lines of work; and of those who wish to undertake research work.

**SUPERVISED TEACHING.** Through co-operative agreement with the schools of Ames and adjoining towns, students who expect to teach have the privilege of teaching classes in the elementary and secondary schools. This work is under the direct supervision of the Home Economics Education Department.

**GRADUATE WORK.** Major work for the degree of Master of Science is offered in all departments. Major work for the degree of Doctor of Philosophy is offered in the department of Foods and Nutrition.

**OPPORTUNITIES FOR HOME ECONOMICS GRADUATES.** Home Economics graduates of Iowa State College are in demand as state supervisors, teachers of secondary schools and colleges, specialists in extension service, home demonstration agents, dietitians, institutional managers, home service directors for public utility companies, research workers, techni-

cians in commercial laboratories, workers in retail clothing and house furnishing departments, and members of editorial staffs of magazines and newspapers.

**PLACEMENT SERVICE.** The Home Economics Division through its placement office, endeavors to find positions for all graduates but those desiring to teach in high schools. This group is served by the placement office of the Vocational Education Department. The service is also extended to alumnae who wish to make changes in positions and to undergraduates needing employment through summer vacations.

**OMICRON NU.** Gamma chapter of Omicron Nu, a national honor society, was installed at Iowa State College in 1913. The object of the organization is to recognize and promote scholarship, leadership, and research among the students in Home Economics. Members are chosen from the upper one-fourth of the senior class and the upper one-fifth of the junior class. Fifteen per cent of those having senior rating and five per cent of those having junior rating may be selected.

**PHI UPSILON OMICRON.** Omicron chapter of Phi Upsilon Omicron, a national honorary professional fraternity, was installed at Iowa State College in 1926. This organization recognizes potential ability, promotes scholarship, and stimulates interest in Home Economics movements locally and nationally. Members are chosen from the upper two-fifths of the junior and senior classes.

**DELTA PHI DELTA.** Omicron chapter of Delta Phi Delta, a national honorary professional fraternity, was installed at Iowa State College in 1928. The object of the organization is to promote art interests among college students, to stimulate higher scholarship, and to recognize potential ability. Members are chosen from junior or senior students majoring in Applied Art who have good scholastic averages in general subjects and high scholastic averages in art subjects.

**THE HOME ECONOMICS CLUB.** This club, to which all students of the Division are eligible, furnishes a forum for the discussion of subjects of general interest in Home Economics. It arranges for lectures by speakers of national reputation. It is in charge of the annual freshman party given in the Fall Quarter, and assumes major responsibility for the Open House which is an important feature of the all-college three-day celebration held in the Spring Quarter. The club maintains the Catherine MacKay loan fund and sends delegates to the annual convention of the American Home Economics Association.

**THE MARY F. RAUSCH PRIZE.** This prize is offered to the junior Home Economics student having the best record in scholarship, character, and initiative.

**LOAN FUNDS.** The Catherine MacKay and the Frances A. Shelden memorial loan funds give assistance to worthy students in the Home Economics Division. The Julia McCulloch Smith loan is available to senior women preferably in the departments of Foods and Nutrition and Home Economics Education.

**PUBLICATION.** The Iowa Homemaker, a monthly magazine, is published by the students of the division interested in preparing for editorial work in the field of Home Economics.

# Division of Industrial Science

DEAN FRILEY, Central Building, Room 111

HAROLD V. GASKILL, Assistant to the Dean, Central Building, Room 111

**FUNCTIONS.** The Division has two major functions:

1. To offer carefully planned curricula in the biological, physical, and social sciences, with particular emphasis upon the applications of these sciences to industry and commerce, and to the problems of present-day civilization.

2. To provide thorough instruction in the basic sciences and the general studies which form an essential part of the technical and professional curricula offered in the other Divisions of the College.

**ORGANIZATION.** The Division of Industrial Science includes the following departments of instruction: Bacteriology, Botany, Chemistry, Economics and Sociology, English, Geology, History and Government, Hygiene, Library, Mathematics, Military Science and Tactics, Modern Languages, Music, Physical Education for Men, Physics, Psychology, Public Speaking, Religious Education, and Zoology and Entomology.

**FACULTY.** The faculty of the Division is made up of the following:

1. Members of all Departments within the Division.

2. Members of the Departments of Veterinary Anatomy, Veterinary Pathology, and Veterinary Physiology, administered in the Division of Veterinary Medicine.

3. Designated representatives from other Divisions.

**CURRICULA.** The Division of Industrial Science offers the following curricula, which are fully described on the pages indicated.

**INDUSTRIAL SCIENCE.** See page 284.

**CHEMICAL TECHNOLOGY.** See page 205.

**AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY.** See page 165.

(Administered jointly by the Division of Agriculture and the Division of Industrial Science.)

These curricula lead to the degree of Bachelor of Science.

**PREPARATION FOR MEDICINE, VETERINARY MEDICINE, AND LAW.** In the curriculum in Industrial Science, special programs are offered for those who wish to prepare for the study of law, medicine, or veterinary medicine. See pages 287, 288.

**GRADUATE STUDY.** Through the Graduate College the degrees of Master of Science and Doctor of Philosophy are awarded in certain fields of the biological sciences, the physical sciences, and the social sciences. For details, see the description of the work of the Graduate College, page 136.

**OPPORTUNITIES FOR GRADUATES IN INDUSTRIAL SCIENCE.** The remarkable development of the sciences in the last half-century, and the extensive applications of these sciences to present day industry and commerce, and to the economic and social aspects of modern life, have resulted in an increasing demand for scientists and technicians in industry, and for teachers and investigators of science. It is generally believed that scientific development in the next fifty years will be far greater than that of the past, with correspondingly wider opportunities for adequately trained young men and women.

An illustrated booklet, "The Sciences at Iowa State College," describing in detail the opportunities in each of the major scientific fields, may be secured by writing to the Registrar of the College.

**PERSONNEL SERVICE.** Through its Personnel Office the Division of Industrial Science keeps in close contact with those industries, commercial organizations, and other fields of activity that require the services of young men and women trained in the sciences, and assists in securing positions for properly qualified graduates. This service is available to the members of each graduating class, and to graduates of earlier years who desire to enter new lines of work. Students who wish to secure positions as teachers of science in the secondary schools or colleges are assisted by the Teachers Placement Service maintained by the College.

**HONORS AND HONOR SOCIETIES.** Scholarship holds a high place in Iowa State College, and appropriate honors are bestowed upon students whose academic records are outstanding. In addition to prizes and letters, there are many honor organizations for admission to which high scholarship is a prerequisite. Among those open to students in the Division of Industrial Science are the following:

Phi Lambda Upsilon	Chemistry	Men
Iota Sigma Pi	Chemistry	Women
Inkhorn	English	Men
Chi Delta Phi	English	Women
Delta Sigma Rho	Forensics	Men and Women
Pi Mu Epsilon	Mathematics	Men and Women
Scabbard and Blade	Military Science	Men
Phi Mu Alpha	Music	Men
Sigma Alpha Iota	Music	Women
Psi Chi	Psychology	Men and Women
Phi Kappa Phi	All-College	Men and Women
Sigma Xi	All-College	Men and Women
Mortar Board	All-College	Women
Cardinal Key	All-College	Men

**THE INDUSTRIAL SCIENCE COUNCIL** is the governing body of the student organizations and activities in the Division of Industrial Science. The Council which is made up of representatives of both students and faculty, endeavors to bring the various departments of the Division into closer fellowship, and to promote a spirit of loyalty to the Division and to its members. It also represents Industrial Science students in all matters having to do with the welfare of the student body as a whole.

**THE SCIENCE WOMEN'S CLUB** provides opportunity, through its monthly meetings, for the consideration of matters of common intellectual interest, and sponsors the social activities of the women students in the Division of Industrial Science.

# Division of Veterinary Medicine

DEAN MURRAY, Veterinary Administration Building, Room 201

The Division of Veterinary Medicine was established in 1879. It is the oldest veterinary college in the United States. It has always been an integral part of the Iowa State College. All staff members are experienced in their respective fields and devote their entire time to their college duties.

The following departments are included in the Division:

Anatomy . . . . .	p. 321	Physiology and	
Hygiene . . . . .	p. 322	Pharmacology . . . . .	p. 326
Medicine . . . . .	p. 323	Surgery . . . . .	p. 327
Obstetrics . . . . .	p. 324	Research . . . . .	p. 364
Pathology . . . . .	p. 325		

The faculty of the Division of Veterinary Medicine consists of the Dean of the Division, the professors at the head of the departments, the associate and assistant professors, and instructors in the departments. Representatives of departments outside of the Veterinary Division, in which the veterinary students do a part of their work, are considered members of the veterinary faculty.

The course of instruction extends over four years and is designed for the professional training in veterinary medicine of those who have made the necessary preparation in some recognized high school and college. (See entrance requirements.) While one year of college work is the minimum entrance requirement at present, students are urged to complete two years. A reading knowledge of French and German and training in physics will be found to be of great assistance in solving many of the problems confronting the veterinary student.

The four-year curriculum leads to the degree of Doctor of Veterinary Medicine.

Aside from the strictly educational departments in the Division, there is also the Department of Veterinary Research, which gives the student rare opportunity to observe those phases of veterinary science in which this department is engaged.

The equipment for instruction in Animal Husbandry, consisting of large flocks and herds of carefully selected breeds of livestock, is of the best and helps to render practical instruction very efficient. The most perfect types of the different breeds are used for class work. In this way the work in Veterinary Medicine is linked with that in Agriculture, an arrangement which proves to be of inestimable value to veterinarians.

The fact that the College is located in the center of the richest livestock country in the world provides a rare opportunity for the veterinary student to study animal industry; it also enables him to observe a wealth

of clinical cases both at the Veterinary Hospital, and under general practice conditions.

Work in Chemistry, Biology, and other related sciences is adequately provided for in the special buildings for the accommodation of these several departments of college work. Each branch of study is presented to the student by a specialist.

Candidates for graduation must be twenty-one years of age, of good moral and professional character, and must be approved by all the departments of the Division, to secure the degree of Doctor of Veterinary Medicine.

# Graduate College

DEAN BUCHANAN, Central Building, Room 110

## HISTORY AND ORGANIZATION

Iowa State College has offered opportunities for graduate work to qualified students since the founding of the institution. The first advanced degree was conferred in 1877. In the earlier years the work of the graduate students was in immediate charge of the departments concerned, under the supervision of the General Faculty. Later each of the five divisional faculties of the College: Agriculture, Engineering, Home Economics, Industrial Science, and Veterinary Medicine, assumed control of the graduate work of the students of the departments administered within the respective divisions. In 1913 a distinct Graduate Faculty was organized, and an executive Graduate Committee appointed. This Graduate Faculty consists of the President, the Dean of the Graduate College, the Deans of the five major divisions, the Librarian, the Registrar, the heads of departments offering major graduate credit, other members of the instructional and research staffs of the institution who are in direct charge of courses offered only to graduate students for major credit, and the examiner in modern languages.

## GENERAL STATEMENT

The Iowa State College is a technical institution. Its Graduate College offers to qualified students the opportunity to pursue advanced courses and to undertake research in technology and those branches of science that find their application in industry. No major graduate work is offered in the so-called liberal arts subjects. Most of the technical and scientific departments give courses and direct research leading to the degree of Master of Science. A smaller number offer major work leading to the degree of Doctor of Philosophy. The engineering departments recommend the appropriate professional degrees for those who are qualified by training and experience. Many departments have special requirements for advanced degrees. These are to be regarded as supplementing the general rules.

The immediate aims of graduate study differ from those of undergraduate study. The graduate student should seek to develop the power of independent work, to become imbued with the true spirit of research, to specialize without becoming narrow. He is expected to read widely in those fields related to his major work, and to become familiar with the workers actively engaged in productive research. The Master's and Doctor's examinations, particularly the latter, should show a wide acquaintance with the literature of the subjects of his major and minor departments.



## ADMISSION

Admission to the Graduate College for the purpose of pursuing advanced work is prerequisite to admission to candidacy for a degree.

I. **APPLICATION AND TRANSCRIPT OF RECORD.** Before the prospective graduate student can be classified he must fill out application blanks for admission to the Graduate College. These may be secured either from the Registrar or the Dean of the Graduate College. When filled out, the blanks are presented or forwarded to the Dean of the Graduate College. There should be filed at the same time a complete official transcript of all previous educational work, including high school credits. If the application is approved, an admission card admitting the student to the Graduate College is sent by the Registrar to the Dean of the Graduate College.

II. **QUALIFICATIONS.** To be admitted to the Graduate College the prospective student must be a graduate of an institution whose requirements for the Bachelor's degree are substantially equivalent to those of Iowa State College. Scholastically, the applicant must be in the upper 50 per cent of the class in which he was graduated.

### A. Unrestricted Admission.

Graduates of institutions on the approved list of the Association of American Universities will be admitted to the Graduate College provided the departmental requirements for the proposed major fields have been met.

### B. Provisional Admission.

1. Graduates of institutions not on the approved list of the Association of American Universities but upon lists of recognized regional accrediting associations will be admitted provisionally to the Graduate College provided also that the departmental requirements for the major fields have been met. The qualifications and accomplishments of students thus provisionally admitted will be reviewed at the end of one quarter in residence and the status of the student determined by the Graduate Committee. In general, graduates of recognized foreign universities will be admitted in accordance with the provisions of this paragraph.

2. Graduates of institutions accredited by recognized regional associations as "Institutions Primarily for the Training of Teachers" who plan to take major work in home economics education, vocational education, or industrial arts education, may be admitted provisionally. They will not ordinarily be admitted to graduate standing with major in other fields.

3. Graduates of institutions not on the approved list of the Association of American Universities nor of the recognized regional accrediting associations are in general not eligible for admission to the Graduate College. Exceptions may be made by the Graduate Committee provided the prospective candidate passes special examinations covering preparation in the proposed major and related fields and such other tests as may be set. Students admitted under this provision may qualify for unconditional admission only after completion of one quarter's successful work and upon review of all circumstances and approval by the major department and the Graduate Committee.

An applicant will not be admitted unless he has such preparation for his major work as should enable him to proceed to the degree of Master of Science in not more than six quarters, provided a full schedule is carried.

## REGISTRATION AND CLASSIFICATION

After matriculation, the student will register and classify in accordance with the following regulations:

a. **CONSULTATION.** If there are questions concerning work which the student desires to clear up before classification, he should consult the head of the department in which he is to take his major work, or the Dean of the Graduate College. Classification for residence work is completed as follows:

b. **PAYMENT OF FEES.** Payment of the registration fee is made at the office of the Treasurer.

c. **PRELIMINARY CLASSIFICATION.** Classification is initiated by outlining the curriculum for the quarter in consultation with the person in charge of the major work. If the major department is not chosen, the Dean of the Graduate College shall be in charge. Time Cards will be found in the offices of the heads of departments or in the office of the Dean of the Graduate College. These Time Cards are signed by the person or persons in charge of the major work and by the head of the department in which the major work is taken. These faculty members together with those in charge of the minor work constitute the student's advisory committee, and have general supervision over his graduate work.

d. **CLASSIFICATION WITH THE DEAN.** Classification is completed by filing in the office of the Dean of the Graduate College the admission card (upon first classification only), the Dean's directory and statistical cards (secured at the time of payment of registration fee), and upon approval by the Dean, the Time Cards showing the curriculum outlined. The Dean of the Graduate College retains one of these Time Cards and sends one to the head of the major department and one to the Registrar.

e. **CHANGES IN CLASSIFICATION.** Changes in classification are made only upon filing in duplicate a "change in Graduate College classification" sheet, and upon approval of the Dean.

f. **CHOICE OF COURSES.** Courses chosen for graduate credit must be from among those listed as giving such credit in the Graduate Catalogue. Other courses may be taken as supporting courses but not credited toward an advanced degree.

g. **CREDITS.** Classification in courses carrying full graduate credit is ordinarily limited to a maximum of fifteen credits per quarter. Exceptions to this rule must have the specific approval of the Dean. It is expected that all graduate work for the completion of an advanced degree shall be completed within a term of five years. Only in exceptional cases, upon recommendation of the department concerned and approval by the Graduate Committee, will credit be allowed in courses taken over a period of more than five years.

Graduate students (even though course and residence requirements

have been met) must register in any quarter in which the facilities of the institution are being used in preparation of thesis or for examination.

h. **VISITOR'S PERMITS.** Permits to attend classes as auditor are secured by indicating on the Time Cards under "supporting courses" and marked "visitor." This should have the approval of the head of the department in which the major work is taken and the Dean of the Graduate College. Permits are issued by the Registrar.

## CLASSIFICATION IN ABSENTIA

Graduate credit is not allowed for correspondence courses. In exceptional cases permission may be granted to students who have been in residence in the Graduate College to do a limited amount of work *in absentia*. The total credit thus obtained cannot exceed that previously gained in residence. Credit thus obtained will not be counted as residence credit. The cases where this is allowed are confined practically to research problems, such as agricultural surveys, and ecological surveys in botany and zoology, which can best be carried on in the field under the supervision of the student's major department. Permission to classify *in absentia* must be given by the head of the student's major department and approved by the Dean of the Graduate College. Classification *in absentia* is completed as follows.

a. **PRELIMINARY CLASSIFICATION.** Standard time cards listing the research courses in which the student is to be classified are signed in triplicate (or quadruplicate) by the individual under whom the major work is taken and the head of the major department, then forwarded to the Dean of the Graduate College. These should be marked plainly, "*In Absentia.*"

b. **PAYMENT OF FEES.** The student will forward the required fee of \$1.00 per credit hour to the Dean of the Graduate College. This fee will be paid to the Treasurer of the College, who will issue the registration card to the Dean.

c. **REPETITION OF CLASSIFICATION.** One classification and registration only will be required during any single school year, except in case of change of classification.

## INTERIM CLASSIFICATION

Graduate students who are in residence during periods between the closing and opening of the regular quarters of the academic year may upon special permission, register for graduate work under the regular members of the instructional staff who are in residence. Students may register in not to exceed one credit per week. Fee for such classification will be \$3 per credit hour.

## FEES AND EXPENSES

For Fall, Winter, Spring, see page 107.

For Summer Session, see page 354.

## DEGREES

The higher degrees conferred by the Iowa State College are Master of Science, and Doctor of Philosophy; the professional degrees are Agricultural Engineer (A.E.), Architectural Engineer (Arch.E.), Ceramic Engineer (Cer.E.), Chemical Engineer (Ch.E.), Civil Engineer (C.E.), Electrical Engineer (E.E.), Engineer of Mines (E.M.), Industrial Engineer (I.E.), Mechanical Engineer (M.E.).

## REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

The requirements of paragraphs 1 to 11 inclusive below must be met by all candidates for the degree of Master of Science. In exceptional cases students who are properly qualified may pursue work toward the degrees of Master of Science and Doctor of Veterinary Medicine coincidentally in accordance with paragraph 12 below.

1. **RESIDENCE.** At least three quarters or a minimum of thirty weeks must be spent in resident graduate work.

Not more than one-fourth of the residence requirement may be satisfied in certain departments by attending Saturday classes.

Arrangements have been made whereby graduate students in certain departments may earn a portion of their resident credit at the State University of Iowa.

2. **CREDITS.** At least forty-five hours of creditable graduate work must be completed, not less than four-fifths of which must be taken in residence at this institution.

3. **DISTRIBUTION OF CREDITS BETWEEN MAJOR AND MINOR.** A minimum of thirty credit hours shall be completed in the major work. Minor work is usually required; it may be taken in the same department as the major, but in a distinct subdivision of that department. The exact number of credit hours in minor work is not prescribed.

4. **JOINT MAJOR.** Major work may, upon special recommendation of the departments concerned and approval of the Dean, be taken in two closely related departments. In such cases a minor is optional.

5. **MODERN LANGUAGE.** Except where specifically waived in the description of requirements of the student's major department in the Graduate Catalogue, a satisfactory reading knowledge of French or German must be certified by the Head of the Department of Modern Languages prior to admission to candidacy. In special cases, upon recommendation of the head of the department in which the major work is taken, and approval of the Dean, some other foreign language of particular value to the work of the candidate may be substituted for French or German.

Students who are unable at the time of their admission to meet the foreign language requirement in the department in which the major work is taken should not ordinarily expect to be able to complete the work for the degree of Master of Science in the minimum length of time.

Such students will classify in appropriate courses in modern languages as "Required" (R) without designation of numbers of hours and without credit.

6. **GRADUATE COURSES.** Credit in major work can be secured only by the completion of courses chosen from the list given in the Graduate Catalogue headed "Open to graduates-only. Major or minor," and "Open to graduates and advanced undergraduates. Major or minor." Courses for which minor credit is desired may be chosen from either of the lists mentioned above and from the list headed "Open to graduates for minor only."

Other courses (listed as supporting courses) may be taken but not credited toward an advanced degree.

7. **ADVANCEMENT TO CANDIDACY.** A student registered in the Graduate College may become a candidate for the degree of Master of Science by conforming to the following regulations:

a. **PRELIMINARY RESIDENCE REQUIREMENTS.** The student must have been registered in the Graduate College for at least one quarter.

b. **APPLICATION.** A blank form requesting admission to candidacy may be secured from the office of the Dean. This application must be approved and signed by the head of the department in which the major subject is offered, by the person in charge of the major, and must include certification that all modern language and English requirements have been met. Final approval of the candidacy will be determined by the Graduate Committee.

c. **WHEN COMPLETED.** Candidacy must be completed and approved at least one quarter or term before the conferring of the Master's degree.

8. **EXAMINATION.** Final examination shall be taken on all graduate work including thesis. This examination shall be in charge of the student's advisory committee. It will ordinarily be oral, but may be written in whole or in part as determined by the committee in charge. The purpose of this examination is to determine the candidate's general fitness and preparation. This examination shall be held at such time and place as are appointed by the Dean, and shall be completed at least one week prior to the close of the quarter in which the degree is to be granted.

The report of the examination after it has been signed by all the members of the committee will be forwarded promptly to the Dean of the Graduate College.

9. **THESIS.** Thesis is required by all departments. Joint theses are not acceptable. Copies of the completed thesis must be in the hands of the examining committee and the Librarian one week prior to the date fixed for the final examination.

10. **DIPLOMA SLIP.** A diploma slip (obtained at the office of the Dean of the Graduate College), must be filled out and returned before the middle of the quarter in which the student expects to take his degree.

11. **O. K. SLIP.** Upon completion of other requirements, the candidate will secure from the office of the Registrar an "O. K. slip." This must be filled out completely and returned to the Registrar by the date indicated thereon.

12 **SPECIAL REGULATIONS FOR STUDENTS IN VETERINARY MEDICINE.** Specially qualified graduates in scientific curricula, when the request has

been approved by the Dean of Veterinary Medicine and the Dean of the Graduate College, may pursue work coincidently toward the degrees of Master of Science and Doctor of Veterinary Medicine. The major graduate work of such student must be completed in courses not required in the undergraduate curriculum in Veterinary Medicine. A student taking advantage of this opportunity will classify both with the Dean of Veterinary Medicine and the Dean of the Graduate College.

## REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

The primary requirements for the degree of Doctor of Philosophy are three: (1) High attainment and proficiency of the candidate in his chosen field, (2) The development of a thesis which shall be a real contribution to knowledge and which shall show power of independent and creative thought and work, and (3) The successful passing of examinations over the field of the candidate's major work in detail, with a satisfactory showing of his preparation in related and minor courses.

Upon admission of the graduate student to work looking toward the degree of Doctor of Philosophy, the Dean of the Graduate College will appoint a committee of the Graduate Faculty to be in charge of his work. This committee shall consist of the following: The faculty member who will be in charge of the major research (chairman), representatives of the departments in which both major and minor work is to be taken, and such other representatives of the Graduate Faculty as may be appointed by the Dean. This committee shall file with the Dean of the Graduate College at least one quarter in advance of the preliminary examination, an outline of the curriculum to be pursued by the student.

The degree of Doctor of Philosophy may be conferred upon candidates who have met the following requirements:

1. **RESIDENCE.** A minimum of three years in graduate study, of which one-half at least is to be in residence, except that in special cases the residence requirement at this institution may be reduced to one year. The degree will be conferred not solely as a result of faithful study over any period, but for researchwork of a scholarly character, and the successful passing of all examinations.

2. **MAJOR AND MINOR WORK.** Major work shall be taken in one department or subdivision of a department, or, in exceptional cases, in two closely related subjects. A first and second minor shall be chosen, one of which shall be taken in a separate department from that in which the major is taken.

3. **MODERN LANGUAGES.** A satisfactory reading knowledge of French and German must be certified by the Head of the Department of Modern Languages before application is made for preliminary examination. In special cases, upon recommendation of the head of the department in which the major work is taken, and approval of the Graduate Committee, another language may be substituted for either French or German.

4. **GRADUATE COURSES.** Credit in major work can be secured only by the completion of courses chosen from the lists headed "Open to graduates only. Major or minor," and "Open to graduates and advanced

undergraduates. Major or minor." During the last two years of the graduate work, the courses selected generally should be from the list headed "Open to graduates only. Major or minor." Courses for which minor credit is allowed may be selected from either of the lists mentioned above and from the list headed "Open to graduates for minor only." Supporting courses not allowed for graduate credit are frequently advisable.

5. **PRELIMINARY EXAMINATION AND ADVANCEMENT TO CANDIDACY.** The student must pass satisfactorily a preliminary examination before admission to candidacy for the degree. It must be passed at least three quarters before the final examination. Exceptions to this rule will be made only upon special recommendation of the student's committee and approval of the Graduate Committee. In no case may the final examination be given in less than six months from the time of the preliminary examination. The dates and places for this examination will be fixed by the Dean upon recommendation of the committee in charge. The examinations are usually both written and oral unless otherwise specifically recommended by the committee. Upon the satisfactory passing of the preliminary examination, the committee will file with the Dean a statement of additional requirements to be met by the student before the final examination and shall recommend admission to candidacy.

The preliminary examination should satisfy the committee as to the student's knowledge of the courses taken in the major and minor fields and any other courses essential or prerequisite to a satisfactory understanding of the major field. An answer to the following queries should be sought. Does the preparation of the student indicate that he has the background, training, and ability necessary to carry on research with a reasonable probability of success? Is the research topic chosen satisfactory and suitable? Has a satisfactory start been made upon it? Does the student have that knowledge of literature of his field and command of English and foreign languages desirable?

6. **THESIS.** A doctoral dissertation (thesis) shall be completed on some topic connected with the major subject. To be acceptable it must constitute a real contribution to knowledge. Copies of the completed thesis must be in the hands of the examining committee and the Librarian one week prior to the date fixed for the final examination. Two complete and approved typewritten copies of the thesis shall be deposited with the Librarian, for binding. Publication of the thesis or an approved abstract thereof is required. The candidate, with the approval of his committee and the Dean of the Graduate College, may choose either one of the following alternatives (a or b) to fulfill the publication requirement.

- a. The thesis is to be published, either privately by the candidate or by a standard scientific publication. Publication shall be either in full or in part as determined by the candidate's committee. One hundred copies of the thesis shall be deposited with the Librarian. If the thesis is curtailed or modified in publication, the fact that the complete thesis is on file should be noted on the first page of text or on the title page of the thesis copies deposited. If the published thesis is not available for deposit at the time the degree is sought, the candidate will deposit with the Treasurer the sum of

**\$50.00.** This sum will be refunded within 60 days after the deposit of the 100 copies in acceptable form. If the 100 copies are not filed within five years, the sum will revert to the library.

- b. An acceptable and approved abstract of the thesis may be filed with the Librarian, and the sum of \$5.00 per printed page (400 words) or fraction thereof paid to the Treasurer. This abstract will normally contain at least 1,000 to 1,200 words and the minimum fee is \$15.00. The college will thereupon assume the publication of the abstract, and will deposit 100 printed copies with the Librarian.

**7. EXAMINATION.** Final examinations shall be taken on all graduate work including thesis. This examination shall be conducted by the student's advisory graduate committee with such other members of the faculty as may be designated by the Dean. It will be written or oral, or both, as determined by the committee. The examination or examinations shall be held at such times and places as are appointed by the Dean, and shall be completed at least one week prior to the close of the quarter in which the degree is to be granted.

The committee will certify to the Dean of the Graduate College the results of the examination.

**8. DIPLOMA SLIP.** A diploma slip (obtained at the office of the Dean of the Graduate College) must be filled out and returned before the middle of the quarter in which the student expects to take his degree.

**9. O. K. SLIP.** Upon completion of other requirements, the candidate will secure from the office of the Registrar an "O. K. slip." This must be filled out competely and returned to the Registrar by the date indicated thereon.

**10. HOODS.** Candidates for the degree of Doctor of Philosophy will be required either to purchase or to rent hoods to be used at the time the degree is conferred. Hoods must be secured through the Registrar's office.

## PROFESSIONAL DEGREES IN ENGINEERING

The professional degrees in engineering are granted as a recognition of professional standing, development, and attainments. They are granted to those holding degrees in engineering from Iowa State College, upon compliance with the requirements set forth below. Engineering graduates from institutions of equal standing may become candidates for the professional degree on the same basis as graduates of Iowa State College only upon invitation from the Engineering Faculty.

The professional degrees in engineering are: Architectural Engineer (Arch.E.), Agricultural Engineer (A.E.), Ceramic Engineer (Cer.E.), Chemical Engineer (Ch.E.), Civil Engineer (C.E.), Electrical Engineer (E.E.), Industrial Engineer (I.E.), Mechanical Engineer (M.E.), Engineer of Mines (E.M.).

The requirements for the professional degrees in engineering are as follows:

**1. BACCALAUREATE DEGREE.** Completion of a standard four-year curriculum in Engineering at Iowa State College leading to a Bachelor's



degree usually, though not necessarily, corresponding to the professional degree sought.

2. **EXPERIENCE.** The candidate must have had five years' experience in a professional position, three of which shall have been in responsible charge of Technical Engineering work. Engineers who hold a Master's degree in Engineering may qualify by three years of responsible charge in a professional position. Membership in a national professional society and possession of a license to practice professional engineering are given consideration in evaluating the qualifications of applicants.

3. **ADMISSION TO CANDIDACY.** The applicant must be admitted to candidacy at least six months before the degree is sought. Application in writing shall be made to the Dean of Engineering. This application shall contain a complete record of the professional work of the candidate and of his preliminary training, and the title of his thesis. When approved by the Dean of Engineering, and the head of the department in which the degree is sought, and filed with the Dean of the Graduate College, admission to candidacy will be certified by the latter.

4. **THESIS.** A satisfactory thesis must be completed. The thesis shall give evidence of more than ordinary professional attainment; it may be an engineering study of economics or design, or may be of a research nature. Two copies of the thesis in approved form shall be submitted to the head of the department concerned at least two months before the date of commencement. When approved by the head of this department, the Dean of Engineering, and the Dean of the Graduate College, these copies shall be filed with the Librarian at least two weeks prior to the close of the quarter in which the degree is to be conferred.

5. **FACULTY APPROVAL.** The approval of the Engineering Faculty and of the Graduate Faculty are required, except that candidates for the degree of Agricultural Engineer shall secure also the approval of the Agricultural Faculty.

6. **PRESENCE AT COMMENCEMENT.** The candidate must present himself at commencement in order to secure his degree.

## FELLOWSHIPS AND SCHOLARSHIPS

Fellowships and scholarships have been established for the encouragement of graduate work and the promotion of research. They are open to graduates of approved colleges who have the requisite undergraduate, and in some cases, graduate preparation. Appointments will be made only from students who ranked in the highest 25 per-cent of their respective graduating classes. Full graduate programs (15 quarter hours) will be allowed scholars and fellows.

**TEACHING SCHOLARSHIPS.** Stipend \$225 per year. These may be offered by the various departments of the College. Scholars will be expected to teach a minimum of three hours per week in the classroom or six hours per week in the laboratory, or perform equivalent allotted duties for the department granting the scholarship.

**TEACHING FELLOWSHIPS.** Stipend \$450 per year. The scientific and most of the technical departments of the College may each offer one or

more teaching fellowships. Fellows will be expected to teach a minimum of five hours per week in classroom or ten to twelve hours per week in the laboratory, or perform equivalent allotted duties for the department granting the fellowship.

**RESEARCH FELLOWSHIPS AND SCHOLARSHIPS.** Many of the sections of the Agricultural and Engineering Experiment Stations, Industrial Research, the Department of Veterinary Research, and certain college departments may offer research scholarships and fellowships. The stipend for a research scholarship is \$225 per year. For a research fellowship the stipend is \$450 per year. Appointments to research fellowships are usually restricted to those who have had some graduate training.

Research fellows and scholars are expected to do their major work largely in connection with the experiment station or departmental research work being carried on. It is expected that they shall observe and be on duty during experiment station hours during the term of appointment except for such time as is required for the minor and supporting work.

**SPECIAL RESEARCH AND INDUSTRIAL FELLOWSHIPS.** Each year several research fellowships are offered either by the College or by other agencies for the study of special industrial problems. The stipend varies with the nature and importance of the work and the preparation of the fellow.

**APPLICATION.** Application blanks for fellowships and scholarships may be obtained from the office of the Dean of the Graduate College. These blanks, filled out in triplicate, should be returned to that office not later than March 1st. Awards are announced about April 1st.

## GRADUATE ASSISTANTSHIPS

Graduate assistantships have been established in many of the college departments for the encouragement of graduate work and the promotion of research. Similar positions have been established in several sections of the Agricultural and Engineering Experiment Stations. These assistantships are open to graduates of approved colleges who have the requisite undergraduate, and in some cases, graduate preparation. Appointments will be made only from students who ranked in the highest 25 per cent of their respective graduating classes.

A graduate assistant may enroll in graduate work not to exceed two-thirds of a full schedule (a maximum of eleven credit hours).

A prerequisite to appointment as a graduate assistant is the successful completion of some previous graduate work or evidence of ability successfully to carry on research and to serve the department in which the appointment is made.

A graduate assistant in the college is required to teach in class or laboratory one-half of the standard teaching schedule assigned to an instructor in the department in which he is employed, or perform equivalent allotted duties.

A graduate assistant in the experiment station observes experiment station hours, except for such time as is allowed for minor and supporting graduate work. In general, major graduate work undertaken by such a graduate assistant is connected with research being carried forward by the section in which he is employed.

Appointments to college graduate assistantships are for one college year, beginning on the Tuesday preceding the opening of the Fall Quarter and ending on the day before the corresponding day of the following June. Graduate assistants are eligible to reappointment.

Graduate assistantships pay from \$540 to \$720 per year, depending upon the character of the work to be done, and special qualifications of the appointee.

Application blanks may be obtained from the office of the Dean of the Graduate College. These blanks, filled out in triplicate, should be returned to that office not later than March 1st. Awards are announced about April 1st.

## GRADUATE STUDY BY MEMBERS OF STAFF

**MEMBERS OF STAFF ON FULL TIME EMPLOYMENT.** Any member of the instructional or extension staffs of the grade of assistant or instructor, subject to the approval of the head of his department, or any member of the investigational staffs of corresponding grade, subject to the approval of the chief of his section, may carry not to exceed five credit hours of graduate work per quarter, provided such does not interfere with his other duties. This privilege may be extended to members of the instructional staff of the grade of assistant professor, or to members of investigational staffs of equivalent grade, upon approval of the Dean concerned and of the President.

**MEMBERS OF STAFF ON PART TIME EMPLOYMENT.** All adjustments as to amount of work to be taken for credit by members of the staff on part time shall be fixed at time of employment. In general, one additional credit hour of graduate work may be carried for each diminution by one twelfth from full time employment.

**SUMMER SCHOOL.** Other members of the staff may enroll in graduate work during the Summer Quarter if not on duty and not receiving salary from the college during this time. If holding the rank of professor or associate professor they cannot become candidates for a degree from this institution.

## DEPARTMENTS OF INSTRUCTION

AGRICULTURAL ECONOMICS (For description, See Economics, page 153.)

### AGRICULTURAL ENGINEERING

The department offers major work for the degree of Master of Science in drainage and irrigation, farm machinery, farm power, and farm structures; and minor work to students taking major work in other departments. The department certifies for the professional degree of Agricultural Engineer.

Prerequisite to major graduate work is the completion of an undergraduate curriculum in agricultural engineering substantially equivalent to that required of undergraduate students at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department. .

For description of courses, see page 172.

Open to graduates for minor only. 324, 345, 346, 375, 420, 425, 427, 428, 447, 476, 487, 489.

Open to graduates and advanced undergraduates. Major or minor. 528, 536, 546, 577, 587.

Open to graduates only. Major or minor. 609, 628, 636, 646, 661, 662, 663, 677, 687.

## AGRICULTURE

The department offers minor work to students taking major work in other departments.

For description of course, see page 177.

Open to graduates for minor only. 404.

## AGRONOMY

The department offers major work for the degree of Master of Science in crop production, crop breeding, soil physics, soil fertility, soil bacteriology, and soil management; major work leading to the degree of Doctor of Philosophy in soil fertility, soil bacteriology, soil physics, and crop breeding; and minor work to students taking major work in other departments.

Prerequisite to major graduate work in the department is the completion of undergraduate work substantially equivalent to that required of undergraduate students in the curriculum in agronomy at this institution. Students in farm crops should have had at least the equivalent of one year's work in farm crops, one course in general botany, courses in general agriculture and general science, special work in soils and usually advanced courses in farm crops. Students in soils should have had at least the equivalent of one year's work in soils and in chemistry, a course in bacteriology, courses in general agriculture and general science, and usually advanced courses in soils.

Students taking major work in farm crops will usually minor in soils, genetics, or botany, especially in plant physiology, or plant pathology. Students taking major work in soils will usually minor in chemistry, farm crops, botany, bacteriology, agricultural engineering, or geology.

For students wishing to minor in agronomy the following courses are suggested: Farm Crops 414, 504; Soils 554, 664, and 674.

For description of courses, see page 179.

Open to graduates for minor only.

Farm Crops. 304, 305, 410, 414, 424, 445.

Soils. 374, 454, 464, 474.

Open to graduates and advanced undergraduates. Major or minor.

Farm Crops. 504, 546.

Soils. 554, 564.

Open to graduates only. Major or minor.

Farm Crops. 604, 605, 640, 645.

Soils. 654, 664, 674, 690, 695.

## ANIMAL HUSBANDRY

The department offers major work for the degree of Master of Science in animal nutrition, animal production, animal breeding, meats, dairy husbandry, and poultry husbandry (poultry breeding, poultry nutrition);

major work for the degree of Doctor of Philosophy in animal breeding and animal nutrition, dairy husbandry, and poultry husbandry (poultry breeding, poultry nutrition); and minor work to students taking major work in other departments.

The fields of major work listed above will include courses listed in other departments when such courses are appropriate to the student's previous training, major interests, and thesis problem. Thus, those taking major work in all the above fields will often include courses in mathematics (statistical methods); those taking major work in animal and poultry breeding will include courses in genetics and zoology; and those taking major work in animal and poultry nutrition will include courses in physiology, chemistry, etc.

Prerequisite to major graduate work is the completion of an undergraduate curriculum in animal husbandry, dairy husbandry, or poultry husbandry, substantially equivalent to one of those required of undergraduate students at this institution and should include prerequisite undergraduate courses necessary for the particular line chosen. The student should have a general knowledge of zoology, and chemistry (both inorganic and organic).

For description of courses, see page 185.

Open to graduates for minor only. 318, 335, 350, 409, 410, 424, 425, 427, 429, 460, 475.

Open to graduates and advanced undergraduates. Major or minor. 535, 536, 541, 542, 543, 546, 548.

Open to graduates only. Major or minor. 600, 605, 614, 615, 630, 638, 640, 650, 651, 652, 653, 670, 680.

## APPLIED ART

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of undergraduate work in applied art substantially equivalent to that required in the undergraduate curriculum in applied art at this institution.

For description of courses, see page 256.

Open to graduates for minor only. 305, 434, 445.

Open to graduates and advanced undergraduates. Major or minor. 504, 507, 524, 535, 546, 547, 565, 566, 585, 586.

Open to graduates only. Major or minor. 604, 605, 614.

## ARCHITECTURAL ENGINEERING

The department offers major work for the degree of Master of Science in architectural engineering, and minor work to students taking major work in other departments. The department certifies for the professional degree of Architectural Engineer.

Prerequisite to major graduate work is the completion of a standard curriculum in architectural engineering substantially equivalent to that required of undergraduates at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 190.

Open to graduates for minor only. 491, 492, 493, 494.

Open to graduates only. Major or minor. 600, 604.

## BACTERIOLOGY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in physiological, systematic, soil, dairy, veterinary, sanitary and food, and household bacteriology; and minor work to students taking major work in other departments.

Specific prerequisite to major graduate work in bacteriology is the completion of at least one thorough course in general bacteriology, chemistry (including inorganic and organic), and physics. Physiological and bio-physical chemistry are advised. Students taking major work in soil bacteriology should have completed courses in soils substantially equivalent to those required of undergraduates in the curriculum in agronomy at this institution. Students taking major work in dairy bacteriology should have completed courses in dairy industry substantially equivalent to those required of undergraduate students in dairy industry at this institution.

Minor work is recommended in veterinary pathology and histology; physiological, bio-physical, organic, and sanitary chemistry; plant physiology and pathology; soils, dairy industry, or foods and nutrition.

For description of courses, see page 192.

Open to graduates for minor only. 350, 450.

Open to graduates and advanced undergraduates. Major or minor. 534, 535, 536, 537, 554, 555, 556, 557, 560, 561, 562, 563, 564, 571, 572, 573, 574, 575.

Open to graduates only. Major or minor. 631, 632, 633, 655, 656, 674, 690, 695A.

## BOTANY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in ecology, morphology, mycology, pathology, physiology, and systematic and economic botany; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of at least thirty undergraduate credit hours in botany. In certain cases undergraduate courses in bacteriology, farm crops, or horticulture may be in part substituted for botany. Students desiring to take major work in plant physiology should present undergraduate credits in inorganic and organic chemistry, and if practicable in physiological chemistry. Students desiring to take major work in plant pathology should present undergraduate credits in bacteriology, organic chemistry, and whenever practicable in either horticulture or farm crops. Students desiring to take major work in systematic botany should have prerequisites in general morphology.

Students with major in botany will usually select their minor from one of the following: bacteriology, physiological and bio-physical chemistry, physics, zoology and entomology, genetics, farm crops, horticulture, forestry, or geology.

For description of courses, see page 195.

Open to graduates for minor only. 404, 405, 406, 414, 415, 416, 424, 445, 455, 494.

Open to graduates and advanced undergraduates. Major or minor. 505, 546, 554, 555, 556, 557, 559, 564, 565, 566, 571, 572, 573, 574, 575, 576, 584, 585, 594, 595, 596, 597, 598, 599.

Open to graduates only. Major or minor. 606, 611, 612, 613, 617, 618, 634, 635, 636, 641, 642, 643, 644, 654, 695.

## CERAMIC ENGINEERING

The department offers major work for the degree of Master of Science in ceramic engineering, and minor work to students taking major work in other departments. The department certifies for the professional degree of Ceramic Engineer.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in ceramic engineering or chemical engineering at this institution.

For description of courses, see page 199.

Open to graduates for minor only. 416, 427.

Open to graduates only. Major or minor. 601, 602, 603, 608.

## CHEMICAL AND MINING ENGINEERING

The department offers major work for the degrees of Master of Science in chemical engineering and mining engineering; and Doctor of Philosophy in chemical engineering; and minor work to students taking major work in other departments. The department certifies for the professional degrees of Chemical Engineer and Engineer of Mines.

Prerequisite to major graduate work is the completion of a satisfactory undergraduate curriculum in chemical engineering substantially equivalent to that offered at this institution. Students who cannot qualify for major graduate work in chemical engineering on the basis of exact conformity to the above regulation, may enroll in graduate work in conformity with the provisions listed on page 137, section II-B-3.

Minor work will usually be selected from chemistry, mechanical engineering, civil engineering, electrical engineering, ceramic engineering, mathematics, mineralogy, physics, economics, geology, or bacteriology.

For description of courses, see page 203.

Open to graduates for minor only.

Chemical Engineering. 351, 352, 353, 411, 412, 413, 421, 422, 423, 441, 442, 443, 471, 472, 473.

Mining Engineering. 351, 352, 353, 415, 417.

Open to graduates and advanced undergraduates. Major or minor.

Chemical Engineering. 586.

Mining Engineering. 561, 562, 563.

Open to graduates only. Major or minor.

Chemical Engineering 600, 610, 614, 615, 616, 620, 621, 622, 623, 651, 652, 653, 671, 672, 673.

Mining Engineering 600

## CHEMISTRY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in analytical, inorganic, physical, organic, food, sanitary, textile, soil, plant, enzyme, physiological, nutritional, dairy, bio-physical, and special agricultural chemistry; and minor work in these fields and in biochemistry to students taking major work in other departments.

Prerequisite to major graduate work is the completion of undergraduate work in chemistry, mathematics, and physics, substantially equivalent to that required of undergraduate students at this institution whose major is in chemical technology.

For description of courses, see page 207.

Open to graduates for minor only. 314, 321, 322, 323, 345, 346, 347, 348, 411, 412, 427, 431, 432, 433, 441, 442, 443, 466, 474, 495.

Open to graduates and advanced undergraduates. Major or minor. 501, 502, 503, 511, 512, 513, 514, 515, 516, 518, 521, 522, 523, 525, 526, 531, 532, 533, 535, 536, 537, 545, 565, 571, 572, 573, 574, 575, 576, 584, 585, 586.

Open to graduates only. Major or minor. 601, 602, 603, 605, 606, 616, 617, 625, 631, 632, 633, 655, 656, 658, 659, 671, 672, 673, 686, 687, 688, 695.

## CHILD DEVELOPMENT

The department offers major work for the degree of Master of Science in child development, and minor work to students taking major work in other departments. Work on the graduate level in this department is under the supervision of the Director of the Iowa Child Welfare Research Station of the State University of Iowa.

Students desiring to major in child development must meet the prerequisites for courses giving graduate credit, and must present 35 undergraduate quarter credits in home economics (including foods and nutrition, applied art, textiles and clothing, and child care and training), and 6 credits in psychology (general and child psychology).

For description of courses, see page 258.

Open to graduates for minor only. 440.

Open to graduates and advanced undergraduates. Major or minor. 536, 545, 555, 556, 557.

Open to graduates only. Major or minor. 614, 665, 666, 667.

## CIVIL ENGINEERING

The department offers major work for the degree of Master of Science in all the principal subdivisions of civil engineering such as sanitary, structural, municipal, highway, railway, and transportation engineering; and major work for the degree of Doctor of Philosophy in structural, sanitary, and highway engineering; and minor work to students taking major work in other departments. The department certifies for the professional degree of Civil Engineer.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in civil engineering at this institution, and should include prerequisite undergraduate courses necessary for the particular line chosen.

Students who major in civil engineering will usually select minor work from the departments of mathematics, physics, chemistry, bacteriology, geology, economics, or other engineering departments.

For description of courses, see page 214.

Open to graduates for minor only. 335, 336, 354, 355, 356, 364, 404, 405, 414, 415, 416, 417, 418, 419, 436, 437, 438, 439, 444, 445, 456, 466, 477, 485, 490.

Open to graduates only. Major or minor. 604, 605, 606, 607, 608, 614, 615, 616, 617, 634, 635, 636, 637, 638, 639, 644, 645, 650, 654, 655, 656, 657, 658, 659, 664, 674, 677, 679, 690.

## DAIRY INDUSTRY

The department offers major work for the degree of Master of Science in dairy plant management, dairy bacteriology, dairy chemistry, and manufacture of dairy products; major work for the degree of Doctor of Philosophy in dairy bacteriology; and minor work to students taking major work in other departments.

Students expecting to major in dairy industry should have undergraduate training substantially equivalent to that required of undergraduate students in the curriculum in dairy industry at this institution.



For description of courses, see page 224.

Open to graduates for minor only. 304, 305, 306, 307, 308, 309, 350, 404, 450.

Open to graduates and advanced undergraduates. Major or minor. 504, 505, 507, 508, 554, 555, 556, 557.

Open to graduates only. Major or minor. 600, 604, 605, 606, 607, 608, 609, 625, 650, 655, 656, 660, 690C.

## ECONOMICS AND SOCIOLOGY

The department offers major work for the degree of Master of Science in agricultural economics, industrial economics, consumption economics, and rural sociology; major work for the degree of Doctor of Philosophy in agricultural economics and consumption economics; and minor work to students taking major work in other departments.

Students desiring to major in agricultural economics, industrial economics, consumption economics, and rural sociology must present at least thirty undergraduate quarter-credit hours in this general field, nine of which may be in economic history. Those desiring to major in agricultural economics and rural sociology should present additional credits in agriculture.

Each student taking major work in agricultural economics, industrial economics, consumption economics, or rural sociology, before being admitted to candidacy for an advanced degree, must show proficiency in economic theory, finance, and statistics and at least one of the following: sociology or accounting. It is assumed that a part of this work will have been covered in undergraduate courses, and that the balance will be carried as graduate work in addition to work in the field of his major choice in which his thesis shall be chosen. Graduate work in one or more of these lines shall be construed to satisfy the requirement of a minor. Arrangements are made for such students as wish to select a minor outside of the department.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 226.

Open to graduates for minor only. 304, 374, 375, 376, 396, 406, 438, 470, 474, 484.

Open to graduates and advanced undergraduates. Major or minor. 500, 504, 505, 507, 508, 510, 514, 515, 516, 517, 518, 530, 534, 535, 536, 537, 538, 540, 545, 546, 547, 550, 560, 564, 568, 575, 576, 580, 585, 586, 587, 588, 599.

Open to graduates only. Major or minor. 604, 605, 606, 614, 615, 631, 632, 633, 634, 641, 642, 643, 650, 699.

## ELECTRICAL ENGINEERING

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in electrical engineering, and minor work to students taking major work in other departments. The department certifies for the professional degree of Electrical Engineer.

Minor work for the degree of Doctor of Philosophy is limited to mathematics, physics, physical chemistry, and chemical engineering.

Prerequisite to major graduate work in electrical engineering is the completion of undergraduate work substantially equivalent to that required of undergraduate students in electrical engineering at this institution.

For description of courses, see page 232.

Open to graduates for minor only. 331, 332, 333, 421, 422, 423, 431, 432, 433, 451, 452, 453, 465, 466, 474, 475, 476, 477, 478, 494.

Open to graduates and advanced undergraduates. Major or minor. 595.

Open to graduates only. Major or minor. 600, 614, 626, 628, 634, 637, 647, 650, 660, 680, 690.

### ENGINEERING

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in engineering valuation and minor work to students taking major work in other departments. The department certifies for the professional degree of Industrial Engineer.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution, and should include the prerequisite undergraduate courses necessary for the particular line chosen.

For description of courses, see page 235.

Open to graduates for minor only. 354, 405, 406, 407, 416, 417, 425.

Open to graduates only. Major or minor. 604, 605, 606, 694.

FARM CROPS (For description, see Agronomy, page 148.)

### FOODS AND NUTRITION

The department offers major work for the degree of Master of Science in foods and nutrition; major work for the degree of Doctor of Philosophy in nutrition; and minor work to students taking major work in other departments.

Prerequisite to major graduate work in foods or nutrition is the completion of at least 50 quarter credit hours of undergraduate work which should include courses in food preparation, dietetics, physics, general biology, human physiology, bacteriology, and chemistry (general, organic, physiological, and quantitative methods). Students desiring to take major work in foods should present in addition, if possible, undergraduate credits in experimental cookery. It is recommended that in addition to the courses specified the student should have a general background in home economics, although students well trained in the fundamental sciences may qualify.

Students taking major work in foods will usually select their minors from economics, food chemistry, colloidal chemistry, or bacteriology. Students taking major work in nutrition for the degree of Doctor of Philosophy will usually select their minors from economics, physiological chemistry, nutritional chemistry, or physiology.

For description of courses, see page 263.

Open to graduates for minor only. 305, 404.

Open to graduates and advanced undergraduates. Major or minor. 504, 506, 507, 511, 512, 513, 518.

Open to graduates only. Major or minor. 606, 607, 609, 614, 615, 616.

### FORESTRY

The department offers major work for the degree of Master of Science in forest management, forest products and marketing, and forest range management; and minor work to students taking major work in other departments.

Students desiring to major in this department should present forestry credits substantially equivalent to those required of undergraduate students at this institution.

Minor work is usually recommended in botany, particularly plant pathology, agrostology, ecology, dendrology, or plant physiology, entomology, chemistry, soils, landscape architecture, economics, or zoology.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 243.

Open to graduates for minor only. 301, 302, 303, 388, 396, 397, 398, 400, 438, 470, 494, 495, 496.

Open to graduates and advanced undergraduates. Major or minor. 506.

Open to graduates only. Major or minor. 600, 604, 606, 634, 688, 689, 694, 697.

## GENETICS

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in genetics; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of a thorough undergraduate curriculum in agriculture, or preferably in a biological science, which should include one year's work in botany and in zoology, mathematics (including statistics), chemistry, and foreign language (preferably German). In the biological sciences, courses in physiology, morphology, and cytology are highly desirable. One year of physics is also suggested.

Students taking major work in genetics will ordinarily minor in botany, zoology, bacteriology, biochemistry, mathematics, agronomy, animal husbandry, or horticulture.

For description of courses, see page 248.

Open to graduates and advanced undergraduates. Major or minor. 530, 535, 540, 550.

Open to graduates only. Major or minor. 600, 651, 652, 653, 660.

## GEOLOGY

The department offers major work for the degree of Master of Science in applied geology, and minor work to students taking major work in other departments.

Students desiring to major in geology should have completed the equivalent of the following courses: 201, 202, 203, 354, 355, 356; and 434, 435, 436 or 454, 455.

Minor work is usually recommended in mining engineering, chemistry, or zoology.

For description of courses, see page 250.

Open to graduates for minor only. 434, 435, 436, 454, 455.

Open to graduates and advanced undergraduates. Major or minor. 557, 558, 566, 567, 568, 571, 572, 573, 574.

Open to graduates only. Major or minor. 664, 665.

## HISTORY AND GOVERNMENT

The department offers major work for the degree of Master of Science in economic history; and minor work in economic history and government to students taking major work in other departments.

Students desiring to major in economic history must present a minimum of thirty undergraduate quarter credit hours in the general field of history, nine of which may be in political science and in economics.

For description of courses, see page 251.

Open to graduates for minor only.

Economic History. 401, 402, 403, 421, 422, 423, 496.

Government. 424, 435, 436, 446, 468, 476, 495.

Open to graduates and advanced undergraduates. Major or minor.

Economic History. 520, 534, 554, 555, 565, 568, 595.

Open to graduates only. Major or minor.

Economic History. 604.

## HOME ECONOMICS EDUCATION (See Vocational Education, page 162.)

### HOME MANAGEMENT

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of one year's work in each of the following: elementary design, textiles and clothing, and economics and sociology; foods and nutrition, including elementary foods and dietetics; one course each in child development, home management, and general psychology.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 266.

Open to graduates for minor only. 474, 475.

Open to graduates and advanced undergraduates. Major or minor. 517, 518, 579, 584.

Open to graduates only. Major or minor. 614, 677, 684.

### HORTICULTURE

The department offers major work for the degree of Master of Science in general horticulture, pomology, vegetable crops, floriculture, and plant breeding; major work for the degree of Doctor of Philosophy in horticulture; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of courses covering the general field of horticulture and the underlying sciences. Students with major problems in pomology, floriculture, vegetable crops, or plant breeding should present the equivalent of 15 quarter hours (10 semester hours) of undergraduate work in their respective fields, one course in general horticulture, and at least one course in one of the other branches of horticulture mentioned above. The student should also have a working knowledge of inorganic and organic chemistry, botany, and soils equivalent to the requirements outlined in the general curriculum for horticultural students at this institution. In certain cases undergraduate courses in farm crops, soils, botany, and chemistry may be substituted for horticulture.

Students taking major work in horticulture will usually take minor work in soils, genetics, botany (physiology, pathology, or morphology), entomology, chemistry, agricultural economics, or vocational education.

For description of courses, see page 277.

Open to graduates and advanced undergraduates. Major or minor. 501, 514, 516, 518, 521, 522, 523, 524, 525, 526, 527, 528, 546, 547, 564.

Open to graduates only. Major or minor. 600, 601, 602, 603, 604.

## HOUSEHOLD EQUIPMENT

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work for the degree of Master of Science in household equipment is credit in beginning food courses, 12 quarter-credits in advanced physics (covering in detail mechanics, electricity, heat, and light), 9 quarter-credits in household equipment, and chemistry (general, organic, and quantitative methods). It is recommended that the student should have a general background in home economics, but students with fundamental training in chemistry, physics, and bacteriology may be accepted.

Students taking major work in household equipment will usually select their minors from economics, foods and nutrition, institution management, or physics.

For description of courses, see page 269.

Open to graduates for minor only. 404, 405, 435.

Open to graduates and advanced undergraduates. Major or minor. 506, 507, 508, 509, 514, 521, 522, 523.

Open to graduates only. Major or minor. 604, 614.

## INDUSTRIAL ARTS

The department offers major work for the degree of Master of Science in industrial arts, and minor work to students taking major work in other departments.

Students desiring to major in industrial arts must be graduates of the undergraduate curriculum in industrial arts, or of a recognized four-year collegiate curriculum in industrial or manual arts, or they must present with the Bachelor's degree, thirty-six quarter-credits in industrial arts (including manual training), and fifteen credits in psychology and education, or offer a substantial equivalent.

Major work is to be selected from the courses in industrial arts and certain courses in mechanical engineering which relate to industrial arts education. Minor work is recommended to be selected from courses in vocational education and psychology.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 282.

Open to graduates and advanced undergraduates. Major or minor. 504, 510, 515, 516, 518, 524, 525.

Open to graduates only. Major or minor. 600, 605, 607, 608, 609, 610, 614, 617, 620, 630, 650.

## INSTITUTION MANAGEMENT

The department offers joint major work in co-operation with other departments for the degree of Master of Science, and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of at least twenty-three quarter-credits of undergraduate work in home economics, thirteen of which should be in institution management (large quantity cookery, purchasing, institutional equipment, and catering), seven in foods and nutrition (nutrition and dietetics, and meal planning), and three in household equipment.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 271.

Open to graduates for minor only. 484, 485.

Open to graduates and advanced undergraduates. Major or minor. 580, 586, 587, 588.

Open to graduates only. Major or minor. 604, 614.

## LANDSCAPE ARCHITECTURE

The department offers major work for the degree of Master of Landscape Architecture, and minor work to students taking major work in other departments. The degree of Master of Landscape Architecture is granted upon the completion of one year of satisfactory resident graduate work and the acceptance of a thesis based upon at least one full year of subsequent successful professional practice.

Students desiring to major in this department should present credits in landscape architecture substantially equivalent to those secured by undergraduate students in the curriculum in landscape architecture at this institution.

For description of courses, see page 291.

Open to graduates for minor only. 334, 335, 343, 401, 402, 403, 404, 411, 412, 413, 436.

Open to graduates only. Major or minor. 600.

## LIBRARY

The library extends facilities of bibliographic research in the scientific and technical literature of the departments giving graduate instruction. The course "Bibliographic Research" (Library 614) may be allowed as either major or minor credit in any department.

For description of course, see page 293.

Open to graduates only. Major or minor. 614.

## MATHEMATICS

The department offers major work for the degree of Master of Science in mathematics and statistics; major work leading to the degree of Doctor of Philosophy in special fields of applied mathematics; and minor work to students taking major work in other departments.

Students desiring to major in this department should present at least fifteen quarter-credit hours of work in mathematics beyond calculus. It is desirable that this should include differential equations, solid analytic geometry, and theory of equations.

Minor work is usually required in physics, chemistry, engineering, or certain phases of agriculture.

For description of courses, see page 293.

Open to graduates for minor only. 300, 314, 315, 316, 330, 400, 405, 406, 441, 442, 443, 444, 445, 451, 452, 453, 497.

Open to graduates and advanced undergraduates. Major or minor. 514, 515, 516, 535, 536, 537, 541, 542, 543, 550, 554, 555, 599.

Open to graduates only. Major or minor. 600, 604, 605, 610, 611, 612, 613, 620, 621, 622, 623, 626, 627, 631, 632, 633, 640, 651, 652, 653, 654, 655, 656, 657, 658, 659, 661, 662, 663, 666, 667, 668, 674, 675, 681, 682, 683, 699.

## MECHANICAL ENGINEERING

The department offers major work for the degree of Master of Science in mechanical engineering and minor work to students taking major

work in other departments. The department certifies for the professional degree of Mechanical Engineer.

Students desiring to major in this department should have completed an undergraduate curriculum equivalent to that required of undergraduates in mechanical engineering at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 298.

Open to graduates for minor only. 315, 344, 410, 414, 415, 416, 418, 420, 424, 425, 426, 428, 429, 430, 434, 435, 440, 444, 445, 448, 467, 484, 486, 489.

Open to graduates only. Major or minor. 600, 624, 626, 640, 645, 647, 655, 678, 685, 688.

## MINING ENGINEERING (See page 151.)

### PHYSICS

The department offers major work for the degree of Master of Science in physics and for the degree of Doctor of Philosophy in special fields of applied physics, and minor work to students taking major work in other departments.

Prerequisites to major graduate work in physics are: a college course in general physics, at least a year's laboratory course in introductory physical measurements, and additional courses in physics with a total of at least ten credit hours. Mathematics through calculus, and chemistry are also required.

Minor work is usually recommended in mathematics, chemistry, or various phases of engineering.

For description of courses, see page 308.

Open to graduates for minor only. 311, 312, 313, 316, 321, 322, 323, 404, 450, 498.

Open to graduates and advanced undergraduates. Major or minor. 501, 502, 503, 504, 505, 506, 514, 515, 516, 519, 520, 524, 525, 534, 594, 595.

Open to graduates only. Major or minor. 607, 610, 611, 612, 613, 614, 615, 620, 624, 625, 637, 638, 640, 650, 651, 652, 653, 681, 682, 683.

### PSYCHOLOGY

The department offers major work for the degree of Master of Science in certain fields of applied psychology, and minor work to students taking major work in other departments.

Students desiring to major in psychology must have graduated from a recognized technical or professional curriculum substantially equivalent to one of the undergraduate curricula of Iowa State College. The student must have taken at least 15 quarter-credits of psychology, including general psychology, elementary laboratory, educational psychology, and child psychology. The additional background necessary will depend upon the nature of the research selected for the thesis and upon the particular field of work chosen. The following are minimum requirements: Agricultural students, one year each of chemistry, economics and sociology, and mathematics; Engineering students, the equivalent of a standard undergraduate curriculum in engineering and human physiology; Home Economics students, one year each of chemistry or physics, biological science including physiology, and college algebra; Industrial Science students, one year each of mathematics, chemistry, physics, and biological science including physiology.

For description of courses, see page 311.

Open to graduates for minor only. 414, 415, 420, 424, 426, 434, 454, 468, 474, 484, 485, 488.

Open to graduates and advanced undergraduates. Major or minor. 516, 530, 533, 538, 544, 564, 596.

Open to graduates only. Major or minor. 620, 534, 635, 636.

SOILS (For description, see Agronomy, page 148.)

## TEXTILES AND CLOTHING

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of one year's work in history and in economics, chemistry (including inorganic, organic, quantitative, and textile), household physics, applied art (including composition, design, and drawing), and textiles and clothing (including general textiles, clothing construction, and costume design). In addition to the foregoing general requirements, additional prerequisites will be required, depending upon the nature of the work the student wishes to pursue.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 273.

Open to graduates for minor only. 444, 464.

Open to graduates and advanced undergraduates. Major or minor. 504, 514, 524, 525, 526, 527, 544, 545, 554, 565, 590.

Open to graduates only. Major or minor. 610, 614.

## THEORETICAL AND APPLIED MECHANICS

The department offers major work for the degree of Master of Science in theoretical and applied mechanics, and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution, and should include the prerequisite undergraduate courses necessary for the particular line chosen.

For description of courses, see page 317.

Open to graduates for minor only. 324, 327, 338, 344, 378, 498.

Open to graduates and advanced undergraduates. Major or minor. 514, 515, 516, 524, 594, 595.

Open to graduates only. Major or minor. 600, 606, 614, 661, 662, 663, 666, 667, 668.

## VETERINARY ANATOMY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in microscopic and gross anatomy; and minor work to students taking major work in animal husbandry, biological chemistry, pathology, physiology, zoology, and bacteriology.

Prerequisite to major graduate work is the completion of an undergraduate curriculum leading to the degree of Doctor of Veterinary Medicine. Exceptions to this rule must be approved by the Dean of Veterinary Medicine.

For description of courses, see page 322.

Open to graduates for minor only. 201, 202, 203.

Open to graduates only. Major or minor. 616.



## VETERINARY HYGIENE

The department offers major work for the degree of Master of Science in veterinary bacteriology and veterinary hygiene; major work for the degree of Doctor of Philosophy in veterinary bacteriology; and minor work to students taking major work in other departments.

The research facilities of the Department of Veterinary Research are available to approved and qualified students.

Prerequisite to major graduate work is the completion of an undergraduate curriculum substantially equivalent to that in veterinary medicine.

For description of courses, see page 323.

Open to graduates and advanced undergraduates. Major or minor. 429, 524.

Open to graduates only. Major or minor. 690.

## VETERINARY PATHOLOGY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in veterinary pathology, and minor work to students taking major work in other departments.

The research facilities of the Department of Veterinary Research are available to approved and qualified students.

Prerequisite to major graduate work is the completion of an undergraduate curriculum leading to the degree of Doctor of Veterinary Medicine. Exceptions to this rule must be approved by the Dean of Veterinary Medicine.

Minor work is recommended in bacteriology, chemistry, zoology, entomology, physics, botany, or genetics.

For description of courses, see page 325.

Open to graduates for minor only. 255, 256, 354.

Open to graduates only. Major or minor. 650, 655.

## VETERINARY PHYSIOLOGY AND PHARMACOLOGY

The department offers major work for the degree of Master of Science in veterinary physiology, and minor work to students taking major work in other departments.

The research facilities of the Department of Veterinary Research are available to approved and qualified students.

Students expecting to do major work should have a fundamental knowledge of physiology, zoology, anatomy, histology, and chemistry. The exact requirements will depend upon the particular line of work the student expects to pursue.

For description of courses, see page 326.

Open to graduates for minor only. 661, 662, 663.

Open to graduates only. Major or minor. 665.

## VETERINARY SURGERY

The department offers major work for the degree of Master of Science in veterinary surgery, and minor work to students taking major work in other departments.

Students enrolled for work in this department must be graduates of a recognized veterinary college. Exceptions may be made upon special

recommendation of the head of the department and the Dean of Veterinary Medicine.

For description of course, see page 328.

Open to graduates only. Major or minor. 677.

## VOCATIONAL EDUCATION

The department offers major work for the degree of Master of Science in agricultural education, in home economics education, and in vocational education.

**MAJOR IN AGRICULTURAL EDUCATION:** Prerequisite to enrollment in this group is graduation from a curriculum in technical agriculture substantially equivalent to one of the undergraduate curricula at Iowa State College. This should have included elementary courses in psychology and education.

**MAJOR IN HOME ECONOMICS EDUCATION:** Students enrolling in this group must have graduated from a technical and professional curriculum substantially equivalent to that required of undergraduate students at Iowa State College. Minor work may be taken in any department of the Division of Home Economics or in any closely related department; or it may include courses from several home economics departments. Statistical Methods, Mathematics 441, is required.

**MAJOR IN INDUSTRIAL ARTS EDUCATION:** See Industrial Arts, page 157.

**MAJOR IN VOCATIONAL EDUCATION:** Prerequisite to enrollment in this group is graduation from a non-technical curriculum in a standard college, and the presentation of credits in psychology and education amounting to 30 quarter (20 semester) credits.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 333.

Open to graduates for minor only. 406, 407, 491, 492, 493, 494, 495, 496, 497, 498, 499.

Open to graduates and advanced undergraduates. Major or minor.

Agricultural and Vocational Education. 521, 522, 523, 534, 535, 536, 537, 542, 544, 545, 547, 554, 561, 562, 563, 584.

Home Economics Education. 504, 506, 508, 509, 517, 528.

Industrial Arts Education. 510, 515, 516, 518, 524, 525.

Open to graduates only. Major or minor.

Agricultural and Vocational Education. 604, 624, 625, 626, 644, 664, 684.

Home Economics Education. 605, 606, 607, 610, 614.

Industrial Arts Education. 600, 608, 609, 617, 650.

## ZOOLOGY AND ENTOMOLOGY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in the fields of animal biology, morphology, ecology, taxonomy, physiology (comparative and insect), protozoology, parasitology, entomology, apiculture, and economic zoology; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of at least two years of zoological courses, for part of which credit in other biological

sciences may be substituted. Comprehensive courses in general zoology and general chemistry (and in most cases also organic chemistry) are required of all students. Specific requirements, in addition to the elementary undergraduate courses along the lines of major work, depend upon previous training and professional experience.

For description of courses, see page 338.

Open to graduates for minor only. 424, 454, 456, 484, 499.

Open to graduates and advanced undergraduates. Major or minor. 504, 506, 508, 510, 514, 515, 516, 517, 519, 520, 525, 526, 527, 534, 538, 557, 558, 564, 565, 566, 576, 577, 578, 585, 594, 595.

Open to graduates only. Major or minor. 624, 665, 674, 677, 684, 690.

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**DEFINITION OF A CREDIT.** The value of each course is stated in quarter-credits. A credit requires one recitation (involving two hours of preparation), or one three-hour laboratory period or other combination of teacher contact and outside preparation involving a total of three clock hours per week for twelve weeks.

**COURSE NUMBERS:** In each department the courses, for convenience of reference, are given in numerical order. Non-collegiate courses are numbered from 1 to 99. Junior College courses are numbered from 100 to 299. Courses 300 to 399 are primarily for junior students. Courses 400 to 499 are for senior students. Some courses numbered from 300 to 499 are also available for graduate students for minor credit. Undergraduate courses open to graduate students for major credit are numbered 500 to 599, inclusive. Courses for graduate students only are numbered 600 and above.

## ABBREVIATIONS

A.A.—Applied Art  
A.E.—Agricultural Engineering  
Ag.—Agriculture  
Agron.—Agronomy  
A.H.—Animal Husbandry

Arch.E.—Architectural Engineering  
Bact.—Bacteriology  
Bot.—Botany  
Cer.E.—Ceramic Engineering  
Chem.E.—Chemical Engineering

Chem.—Chemistry  
C.D.—Child Development  
C.E.—Civil Engineering  
D.I.—Dairy Industry  
Ec.—Economics  
E.E.—Electrical Engineering  
Engr.—Engineering  
Engr.Dr.—Engineering Drawing  
Engl.—English  
F.C.—Farm Crops  
F.&N.—Foods and Nutrition  
For.—Forestry  
Gen.—Genetics  
Gen.E.—General Engineering  
Geol.—Geology  
Govt.—Government  
Hist.—History  
H.Ec.—Home Economics  
H.Ec.Ed.—Home Economics Education  
H.Mgt.—Home Management  
Hort.—Horticulture  
H.Eq.—Household Equipment  
Hyg.—Hygiene  
I.A.—Industrial Arts  
I.S.—Industrial Science  
I.Mgt.—Institution Management  
L.A.—Landscape Architecture

Lab.—Laboratory  
Lect.—Lecture  
Lib.—Library  
Math.—Mathematics  
M.E.—Mechanical Engineering  
Mn.E.—Mining Engineering  
M.L.—Modern Languages  
Phys.Ed.—Physical Education  
Phys.—Physics  
Psych.—Psychology  
P.S.—Public Speaking  
Rec.—Recitation  
Rel.Ed.—Religious Education  
T.Jl.—Technical Journalism  
T.&C.—Textiles and Clothing  
T.&A.M.—Theoretical and Applied Mechanics  
Vet.Anat.—Veterinary Anatomy  
Vet.Hyg.—Veterinary Hygiene  
Vet.Med.—Veterinary Medicine  
Vet.Ob.—Veterinary Obstetrics  
Vet.Path.—Veterinary Pathology  
Vet.Phys.—Veterinary Physiology  
Vet.Surg.—Veterinary Surgery  
Voc.Ed.—Vocational Education  
Zool.—Zoology

## AGRICULTURAL ECONOMICS

(Including Rural Sociology)

(Administered jointly by the Divisions of Industrial Science and Agriculture as a part of the Department of Economics.)

T. W. SCHULTZ, Head of Department

Professors: Robotka, Von Tungeln; Associate Professors Allbaugh, Harter\*, Hopkins\*, Murray, Shepherd, Thomson, Wakeley; Assistant Professors Anderson, Wilcox; Instructors Elkinton, Quintus, Schickele; Graduate Assistants Atkinson, Austin, Bee, Bitting, Foote; Scholars Richard, Shapiro; Extension Workers Arthur, Bentley, Buchanan, Cady\*, Cowden, Dillon, Eager, Folken, Fish, Galloway, Hamilton, Howell, Macy\*, Maakestad, Oderkirk, Soth\*, Stacy, Thompson, Wallace

The staff in Agricultural Economics and Rural Sociology seeks to analyze and present to students the nature of economic and social forces as they affect the value of agricultural commodities and the well-being of the farming population, and to teach the principles underlying the farmer's adjustment to these forces.

Students in Agricultural Economics and Rural Sociology are given the option of majoring in one of the following fields:

### A. AGRICULTURAL ECONOMICS.

- 1 FARM MANAGEMENT AND ORGANIZATION—to train students for actual farming as either proprietors or managers. The economics and business side of farming is stressed but considerable work in the natural sciences and in technical agriculture is required

\*Absent on leave

2. **AGRICULTURAL MARKETING**—to train students to understand the essential principles underlying agricultural marketing including cooperative marketing, price determination and the relation of public policy to marketing.
  3. **AGRICULTURAL FINANCE**—to train students for land appraisal work, rural banking, and credit agencies serving agriculture. Principles applicable to the financing of agricultural production, marketing, and farm real estate are emphasized including public policy related to agricultural finance.
  4. **LAND ECONOMICS**—to train students in the field of economic problems that arise out of land use, which include land utilization, land tenure, landlord-tenant arrangements, land inheritance customs, taxation, land valuation, conservation, and the relation of each of these to public policy.
  5. **AGRICULTURAL STATISTICS**—to train students to become economic statisticians. In addition to agricultural economics, statistical theory, methodology, and the handling and analysis of economic data pertaining to agriculture are stressed.
- B. RURAL SOCIOLOGY**—to train students as leaders and investigators who can serve as salaried experts in organizations and institutions which serve agriculture and to prepare men and women who plan to take graduate studies and become research workers and teachers in rural sociology.

### Curriculum in Agricultural Economics and Rural Sociology

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 177.

For entrance requirements, see page 99.

#### FRESHMAN YEAR.

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>1</sup>		Credits		Credits
Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101 <sup>1</sup>	2	A.H. 102	2	A.H. 108	2
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 108	3
Gen. Horticulture		General Chemistry		General Chemistry	
Hort. 114	3	Chem. 101	4	Chem. 102	4
General Botany		Animal Biology]]		General Botany	
Bot. 101	3	Zool. 114	3	Bot. 108 or	3
Crop Production		Crop Production		Animal Biology	
F.C. 104	4	F.C. 105	4	Zool. 115	
				Farm Dairying	
				D.I. 114	4
Military 121	1	Military 122	1	Military 128	1
	<u>16</u>		<u>17</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Lib. 106A (Fall); Tech.Lect., Ec. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 177.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

SOPHOMORE YEAR

Gen. Agr. Economics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
Princ. of Sociology Ec. 384	3	Rural Sociology Ec. 386	3	Ec. Hist.-United States Hist. 235	3
Math. and Statistics Math. 241	4	Math. and Statistics Math. 242	4	Math. and Statistics Math. 248	4
General Genetics Gen. 300	3	General Physics Phys. 204	3	Soils Soils 254	3
Military 221	1	Military 222	1	Military 223	1
Electives	3	Electives	3	Electives	3
	<hr/> 17		<hr/> 17		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR AND SENIOR YEARS

1. The Junior and Senior years will cover a minimum of one hundred and three credits, and will be planned to carry forward and expand the field of the student's major study as represented by the option chosen at the end of the Sophomore year. During the last quarter of the Sophomore year a complete program will be worked out by the student in conference with the Head of the Major Department, subject to the approval of the Dean of Agriculture. Duplicate copies are to be filed in the dean's office.
2. The subjects making up the Junior and Senior years must ordinarily be of Senior College rank.
3. A minimum of thirty credits shall be chosen in the field of agricultural economics and rural sociology. Ordinarily, it is desirable that the minimum be exceeded. In addition, supporting subjects from allied departments shall be included in order to develop the major field more adequately.
4. The remaining credits may be selected from other departments in the Division of Agriculture, or from other Divisions of the college.

Description of Courses

For additional courses in Economics and Sociology, see page 225.

110 Technical Lecture. The field of agricultural economics and rural sociology. Spring. Lect. 1. Required.

231, 232, 233. General Agricultural Economics. (231) Farm organization and management. The economic factors involved in the successful organization and operation of a farm. Fall, Winter. (232) Principles of value, and price developed in connection with farm marketing problems; marketing methods; market price; supply and demand and their determinants; elasticity of demand and supply. Prerequisite: 231 or equivalent. Winter, Spring. (233) Principles of distribution developed around the problems of farm income, cost of production and price, labor and wages, savings and interest, land and rent, profits as a reward for business enterprise, and risk taking. Prerequisite: 232. Fall, Spring. Rec. 3. Credit 3 each course.

234. Elementary Economics Statistics. The principles and methods of gathering, analyzing, presenting, and interpreting economic data. Fall, Winter. Rec. 3. Lab. 1, 3 hr. Credit 1 or 4. Students who have classified in or have received credit in Math. 441 may enroll in the laboratory of this course for 1 credit. In all other cases both recitation and laboratory are required.

**330. Creamery Accounting.** A specialized accounting system for creameries. Construction and interpretation of creamery operating statements and balance sheets. Prerequisite: 370 or equivalent. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

**334. Land Economics.** Problems in land ownership. Land tenure. Factors affecting the value of farm land. Selling practices. Regional changes in land utilization. Prerequisite: 233 or equivalent. Fall. Rec. 3. Credit 3.

**335. Co-operation in Agriculture.** The co-operative type of business enterprise with particular reference to its application in farm marketing. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

**336. Farm Management and Accounting.** Principles of farm organization and management applied to Iowa farming. Technique of farm management including the use of farm accounting data. Prerequisite: 233 or equivalent. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

**384. Principles of Sociology.** Essential characteristics of social life. Social influences upon the development of personality and attitudes. Dominant features and trends of contemporary society. Social crises. Social changes. Fall, Winter, Spring. Rec. 3. Credit 3.

**385. Sociology of the Family.** Universal elements of family life. Comparison of family systems of different societies. The effect of social change on the modern family. Nature and problems of interrelationships among family members. Prerequisite: 384. Fall, Winter, Spring. Rec. 3. Credit 3.

**386. Introduction to Rural Sociology.** Rural social problems. Development and functioning of basic rural social institutions. Cultural backgrounds, standards and methods as related to co-operative efforts and social change. Fall, Winter, Spring. Rec. 3. Credit 3.

**396. Forest Finance.** (For. 396). Appraisal of forest land and stumpage. Determination of the profit of forests compared with other land uses. Land classification, forest taxation and credit. Prerequisite 231. Spring. Rec. 4. Credit 4.

**438. Lumber Markets.** (For. 438). Economics of the timber industry. Wholesale and retailing. Exports and imports of lumber and other forest products; prices; lumberman's associations; freight rates, etc. Prerequisite: 231. Winter. Lect. and rec. 4. Credit 4.

**470. General Forestry Economics.** (For 470). Elementary application of economics to forestry. Production, distribution, and consumption of forest products. Production management of forests. Prerequisite: 231. Spring. Rec. 3. Credit 3.

**480. Industrial Sociology.** Study and evaluation of leadership and welfare work in industry—industrial health, housing, recreation, retirement pensions, unemployment insurance, joint-representation, management stabilization, etc. Winter, Spring. Rec. 3. Credit 3.

**484. Recreational Activities.** Theory and practice in making and supervising recreational programs to develop voluntary leaders for group recreation and to strengthen community organization. Prerequisite: 384 or equivalent. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

**499. Special Problems.** Prerequisite: 203, or equivalent and 386 for Rural Sociology. As arranged. Fall, Winter, Spring. Credit 1 to 5.

A. Agricultural Economics

B. Consumption Economics

C. Industrial Economics

D. Rural Sociology

**510. Land Use.** Elementary outlines of land economics. Landlord-tenant relationships. Absentee landlordism. Land values and taxations. Public finance of local governments. Land classification. Rural zoning. Prerequisite: 203 or equivalent. Summer. Credit 3 or 4.

**530. Advanced Farm Organization and Management.** Technique of farm organization and management, particularly as developed in Iowa farming. Prerequisite 233 or equivalent. Fall. Lectures 2. Lab. 1, 3 hr. Credit 3.

**534. Farm Accounting.** Principles of accounting adapted to the farm business. Application of accounting data to farm management. Prerequisite: 233, 370. Spring. Lect. 1. Lab. 1, 3 hr. Credit 2.

**535. Agricultural Finance.** Financial requirements of individual farmers and of farm co-operative organizations. Farm credit policy. The Farm Credit Administration and other leading institutions. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

**536. Business Cycles.** Analysis of agricultural prices; their characteristic movements and position relative to the general price level and the business cycle. Prerequisite: 233. Spring. Rec. 3. Credit 3.

**537. Statistical Analysis.** Correlation analysis; methods of analysis of prices, production data and similar series of time variables. Prerequisite: 234 or Math. 441. Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.



538. **Market Price Determination.** Price making in the market place. Relationship among farm wholesale and retail prices. Speculation and prices. Prerequisite: 233 or equivalent. Spring. Rec. 3. Credit 3.

540. **Economic Geography of Agriculture.** Geographic and economic survey of the conditions under which the world's supplies of agricultural products are obtained; trade routes; centers of trade in agricultural products. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

545. **Transportation.** Development of means of transportation including highways, waterways, and railways; relation of transportation to agriculture, general industry, and the formation of market centers. Prerequisite: 203 or equivalent. Fall. Lect. and rec. 3. Credit 3.

546. **Railway Traffic and Rates.** Theory and practice of rate making and regulation; traffic practice and problems; effect of rates on production and trade. Prerequisite: 545. Winter. Rec. 3. Credit 3.

547. **Agricultural Policy.** The relation of agriculture to the economic life of the nation. Problems arising out of the agricultural and industrial development. Prerequisite: 233 or equivalent. Fall. Rec. 3. Credit 3.

550 **Land Income and Policy.** Land as a factor of production. Economics of land utilization. Theories of rent. Principles of land valuation and taxation. Educational policies pertaining to land use. Conservation. Legislation. Recent tendencies in land use planning. Prerequisite: 203 or equivalent. Summer. Credit 3.

580. **Development of Social Thought.** Sociological thought and problems. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3.

585. **Rural Population.** Composition, characteristics, and movement of rural population as compared with urban. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3.

586. **Rural Leadership.** Specific problems of rural life; selection, development, tasks, obligations, and opportunities of rural leadership. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3.

587. **Rural Social Organization.** Place and function of farmer movements and organizations in a changing rural order. Objectives and role of formal and informal organization in neighborhood, community and rural-urban groups. Prerequisite: 233, 386, or equivalent. Fall. Rec. 3. Credit 3.

588. **Social Legislation and Social Problems.** Analysis of existing, proposed, and needed social legislation and study of methods of attack on social problems. Prerequisite: 233, 386, or equivalent. Winter, Spring. Rec. 3. Credit 3.

599 **Special Topics.** Prerequisite: 233 or equivalent, and 386 for Rural Sociology. Fall, Winter, Spring. Credit 1 to 5.

A. **Agricultural Economics.** Messrs. Allbaugh, Hopkins, Murray, Robotka, Quintus, Schickele, Schultz, Shepherd, Wilcox.

B. **Consumption Economics.** Misses Hoyt, Reid.

C. **Industrial Economics.** Messrs. Benedict, Fuller, Wright.

D. **Rural Sociology.** Messrs. Anderson, Von Tungeln, Wakeley

631, 632, 633 **Agricultural Marketing.** By arrangement. Fall, Winter, Spring, respectively. Credit 3 each course. Mr. Robotka, Mr. Shepherd

634. **Land Valuation.** Spring. Credit 3. Mr. Murray.

641, 642, 643. **Economics of Production.** Including farm accounting and land economics. By arrangement. Fall, Winter, Spring, respectively. Credit 3 each course. Messrs. Allbaugh, Schickele, Wilcox, Schultz.

650 **Seminar.** Staff and graduate student conference. May be taken for not to exceed three hours' credit in any quarter. Mr. Schultz.

699. **Research in Economics and Sociology.**

A. **Farm Management and Organization.** Messrs. Allbaugh, Hopkins, Murray.

B. **Farm Finance.** Mr. Murray.

C. **Foreign Trade.** Mr. Schultz.

D. **Land Economics.** Messrs. Schickele, Schultz, Wilcox.

E. **Marketing.** Messrs. Fuller, Quintus, Robotka, Shepherd.

F. **Price Analysis.** Messrs. Hopkins, Shepherd

G. **Consumption Economics.** Misses Hoyt, Reid

H. **Industrial Production.** Mr. Fuller.

I. **Industrial and Public Finance.** Messrs. Benedict, Wright

J. **Rural Sociology.** Messrs. Anderson, Wakely, Von Tungeln

## AGRICULTURAL EDUCATION

## AGRICULTURAL ENGINEERING

(Administered jointly by the Dean of Agriculture and the Dean of Engineering.)

J. B. DAVIDSON, Head of Department

Professor Giese; Associate Professors Ayres, Dickerson, Sharp;

Instructor Engler

Extension Workers Beaty, Van Vlack, Virtue

*For information concerning the Division of Agriculture, see page 120; for the Division of Engineering, see page 125.*

The department of Agricultural Engineering offers instruction in courses involving the application of engineering knowledge to the solution of farm problems. The most important of these subjects are farm machinery, farm motors, farm buildings, farm sanitary equipment, soil erosion control, drainage and irrigation. All students in agricultural curricula take one or more of these courses.

The department also provides for students who wish to specialize in Agricultural Engineering. A four-year curriculum leading to the degree of Bachelor of Science in Agricultural Engineering was established in 1909. This curriculum includes mathematics, sciences, and fundamental subjects in the different engineering departments; agricultural subjects selected to familiarize the student with the methods of modern scientific agriculture; and thorough treatment of agricultural engineering courses.

Graduates from this curriculum have taken up work along the following lines: College, extension, experiment station and government work in agricultural engineering; advertising, sales and development work with manufacturers of various lines of farm equipment and farm building materials; engineering and contracting on farm buildings, soil erosion control, and drainage; editorial work on farm and trade journals; and farming where drainage, farm structures, and the use of machinery are important factors.

### Special Curriculum for Engineering Students

The degree of Bachelor of Science in Agricultural Engineering is given to students who have completed a four-years' curriculum in Civil, Mechanical, or Electrical Engineering, followed by one year's prescribed work, approved by the Committee on Advanced Standing and the General Faculty.

### Curriculum In Agricultural Engineering

Leading to the degree of Bachelor of Science.

Six months of practical work in agriculture or engineering under the direction of this department is required before graduation.

For entrance requirements, see page 99.

For graduate work, see page 147.

FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		Applied Chemistry	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 107	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 108	3
College Algebra		Plane Trigonometry		Analytic Geometry	
Math. 101	5	Math. 102C	4	Math. 108	5
Engineering Problems		Engineering Problems		Carpentry	
Gen.E. 104	1	Gen.E. 105	1	A.E. 155	2
Drawing and Projection		Theory of Project. Draw.		Working Drawings	
Engr.Dr. 181	2	Engr.Dr. 182	3	Engr.Dr. 188	2
Military 101 or 121	1	Military 102 or 122	1	Military 108 or 128	1
	<hr/> 16		<hr/> 16		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115, Lib. 106C (Winter); Tech.Lect., A.E. 110 (Spring).

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

SOPHOMORE YEAR

Farm Machinery		Crop Production		Dairy Principles	
A.E. 286	3	F.C. 104	4	D.I. 310	2
Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Mechanics and Heat		Elect. and Magnetism		Sound and Light	
Phys. 221	5	Phys. 222	5	Phys. 223	5
Economic History		General Horticulture		Engineering Problems	
Hist. 324	3	Hort. 114	3	Gen.E. 206	1
Livestock Problems		Military 202 or 222	1	Livestock Problems	
A.H. 101	2			A.H. 102 or 103	2
Military 201 or 221	1			Statics of Engineering	
				T.&A.M. 274	3
				Military 208 or 228	1
	<hr/> 18		<hr/> 17		<hr/> 18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Surveying		Rural Structures		Farm Power	
C.E. 325	3	A.E. 375	3	A.E. 346	4
Gen. Agr. Economics		Machine Construction		Farm Drainage	
Ec. 231	3	A.E. 359	2	A.E. 321	3
Materials Lab.		Crop Production		Animal Feeding	
T.&A.M. 327	1	F.C. 105	4	A.H. 416	3
Properties of Materials		Dynamics of Engineering		Hydraulics	
T.&A.M. 334	2	T.&A.M. 344	4	T.&A.M. 378	4
Mechanics of Materials		†Extempore Speaking		Soils	
T.&A.M. 324	5	P.S. 311	2	Soils 254	3
Machine Work		Elective	3		
M.E. 232	2				
Power Measure. Lab.					
M.E. 354	1				
	<hr/> 17		<hr/> 18		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, A.E. 301, 302, 303.

†May be omitted by students admitted to the Reserve Officers' Training Corps. For full information, see page 301.

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Seminar		Seminar		Seminar	
A.E. 401	1	A.E. 402	1	A.E. 403	1
Land Development		Irrigation		Rural Structures	
A.E. 425	4	A.E. 427	3	A.E. 476	3
Engineering Contracts		Farm Power		Engineering Valuation	
Engr. 405	3	A.E. 447	3	Engr. 407	3
Direct Current		Alternating Currents		Farm Utilities	
E.E. 435	3	E.E. 437	3	A.E. 487	3
Direct Current Lab.		Alternating Current Lab.		Electives	8
E.E. 436	1	E.E. 438	1		
Electives	6	Electives	7		
	<hr/> 18		<hr/> 18		<hr/> 18

Students wishing to prepare for work with the farm equipment industry should elect M.E. 310, M.E. 315 and M.E. 344. Those wishing to emphasize farm structures should elect C.E. 335, Arch.E. 384, and L.A. 208; those wishing to emphasize land development subjects should take C.E. 215, Soils 354, L.A. 208.

## Description of Courses

For description of non-collegiate courses, see page 343.

110. **Technical Lecture.** General and agricultural engineering subjects. Spring. Lect. 1. Required.

155. **Carpentry.** (I.A. 155.) Care and use of tools, construction and repair of farm buildings, self-feeders, garages, etc.; framing, lumber bills; drawing. Spring. Lab. 2, 3 hr. Credit 2.

157. **Dairy Mechanics.** For dairy industry students. Sanitary and common pipe fitting, soldering, tinning, belts, pulleys, bearings, painting, valves, and repair of dairy equipment. Lab. 2, 3 hr. Credit 2. Fall.

236. **Farm Machines.** Mechanics and materials. Construction, adjustments, operation, testing, selection, and cost of use of farm machines. Prerequisite: credit or classification in Phys. 221. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

239. **Dairy Machinery.** Construction, adjustment, operation, and care of dairy machines and equipment, boilers, engines, motors, refrigerating and power machinery. Winter. Rec. 4. Lab. 1, 3 hr. Credit 5.

254. **Farm Mechanics.** Includes elementary forge work, soldering, harness repairing, pipe fitting, rope splicing, elementary electric wiring, repair of farm machinery. Fall, Winter, Spring. Lab. 2, 3 hr. Credit 2.

289. **Farm Buildings and Equipment.** Farmstead arrangement. Planning farm buildings with special regard to livestock requirements, economy, convenience, sanitation, appearance, and materials used. Farm utilities. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

301, 302, 303. **Seminar.** Preparation, presentation and discussion of papers on agricultural engineering subjects. Rec. 1. Required each course.

306. **Farm Surveying and Drainage.** For students in Agriculture. Design, location and construction, drainage, surveying. Land surveying for area and mapping. Land descriptions. Drawing maps. Fall, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

324. **Farm Drainage.** Drainage problems of the individual farm; design, location and construction of laterals. Protecting farms from overflow and soil erosion. Prerequisite: C.E. 325. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

334. **Farm Machinery and Power Management.** Mechanics and materials. Construction, adjustment, operation, and testing of farm machinery; measurement and transmission of power. Prerequisite: Physics 204 or equivalent, except for Agricultural Journalism and Two-Year Agricultural students. Fall, Winter, Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

345. **Gas Engines and Tractors.** Construction, operation, adjustment, and care of gasoline and oil engines and tractors. Prerequisite: 334. Fall, Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

346. **Farm Motors.** Construction, adjustment, operation, care, testing, selection, and cost of use of farm engines and tractors. The horse as a motor; windmills, small water wheels, etc. Prerequisite: Phys. 222. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

**356. Farm Building Construction.** Similar to Agricultural Engineering 155 but more advanced. Includes the planning, construction and repair of farm buildings and appliances. Prerequisite: 155. Winter. Rec. 1. Lab. 2, 3 hr. Credit 3.

**359. Machine Construction.** Repair of mechanical farm equipment and construction of experimental machines. Oxy-acetylene and electric welding. Winter. Lab. 2, 3 hr. Credit 2.

**374. Concrete and Masonry.** Materials, specifications, and tests; mixtures, forms, reinforcement; uses of concrete on the farm. Other fireproof building materials. Fall, Spring. Lect. 1. Lab. 1, 3 hr. Credit 2.

**375. Farm Structures.** Arrangement of buildings. Planning farm buildings with special regard to livestock requirements, economy, convenience, sanitation, appearance, and materials used. Prerequisite: credit or classification in T.&A.M. 327. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

**401, 402, 403. Seminar.** Preparation, presentation and discussion of papers on agricultural engineering subjects. Rec. 1. Credit 1 each course.

**420. Drainage and Flood Control.** Rainfall and run-off studies. Stream flow. Laws governing organization and operation of drainage districts. Irrigation. Prerequisite: C.E. 313, Soils 254. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

**425. Land Development.** Reclamation by drainage, flood protection, and pumping. Community outlet problems. Analysis of hydrographic data and flood control. Land clearing. Prerequisite: 324. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

**427. Irrigation.** Water supply, rights, duty, conveyance, pumping. Effects of over-irrigation; remedies; seepage flow. Distributory systems. Irrigation structures. Prerequisite: C.E. 325, Soils 254, T. & A. M. 378. Winter. Rec. 3. Credit 3.

**428. Erosion Structures.** Engineering aspects of soil erosion and its control. Soil saving checks and dams. Terracing. Prerequisite: C.E. 313, Soils 254. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

**436. Soil Erosion Control.** (For. 436). (Soils 436). Field work to study soil type characteristics by profiles, to map selected areas, certain farms and eroded lands. Forests in relation to watershed protection and erosion control; trees used, methods of planting and protection. Engineering aspects of soil erosion and its control; soil saving checks and dams; terracing. Prerequisite: Soils 254 (except for agricultural engineering students). Summer, 10 weeks, credit 10 or may be divided with For. and/or Soils.

**447. Farm Machinery and Power.** Design problems peculiar to farm mechanical equipment. Selection and management of equipment for meeting specific farm conditions and for producing specific crops. Prerequisite: 236. Winter. Rec. 3. Credit 3.

**476. Farm Structures.** Continuation of 375. Details of construction, cost estimating, specifications and bills of material. Special problems. Perspective drawing and simple rendering. Prerequisite: 375. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

**487. Farm Utilities.** Lighting, heating, ventilation, water supply, plumbing, sewage disposal. Prerequisite: 375, Phys. 223. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

**489. Farm Buildings and Equipment.** Plans, materials, construction, lighting, heating, and ventilation of farm buildings; water supply, sewage disposal. Prerequisite: Phys. 204 or equivalent. Fall, Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

**528. Special Topics.** Land development; drainage and irrigation. Mr. Ayres.

**536, 546. Special Topics.** (536) Machine problems. (546) Power Problems. Mr. Davidson, Mr. McKibben.

**577, 587. Special Topics.** (577) Structures. (587) Utilities. Mr. Davidson, Mr. Giese.

**609. Airport Drainage.** Design, location, and construction of drainage systems to insure proper surface and sub-surface water control. Special soil treatment methods to promote growth and maintenance of turf. Rec. 1. Lab. 2, 3 hr. or as arranged. Credit 3. Mr. Ayres.

**628. Land Reclamation Problems.** Soil water, drainage practice, engineering and institutions. Irrigation practice, construction, and organization. Cutover land problems. Mr. Ayres.

**636. Research.** Design, testing, and efficiency of farm implements and machines. Messrs. Davidson, Collins.

**646. Research.** Power problems, including application, efficiency, and economy of power. Messrs. Davidson, Collins.

**661, 662, 663. Seminar.** Discussion of research problems, methods, procedure, and reports. Required of all graduate students in agricultural engineering. No credit. Mr. Davidson.

677 Research. Design of farm structures, materials for farm structures. Mr. Davidson, Mr. Giese.

687. Research. Sanitary equipment, including sewage disposal, water supply, heating, lighting, and ventilation. Mr. Davidson, Mr. Giese.

## AGRICULTURAL JOURNALISM

See *Technical Journalism*, page 314.

## AGRICULTURE

H. H. KILDEE, Dean of Agriculture

*For information concerning the Division of Agriculture, see page 120.*

### Curriculum in General Agriculture

Leading to the Degree of Bachelor of Science.

Six months of practical work under the direction of the division is required before graduation. See page 177.

For entrance requirements, see page 99.

The curriculum in General Agriculture is planned to provide training for students who wish a broad, general knowledge of agriculture, and also the opportunity for special study in certain related fields in the natural sciences, the social sciences or the applied sciences. Those who are looking forward to finding their life work on the farm, will secure in this curriculum the courses which will fit them in the broadest way for useful, well-rounded, successful careers.

While the curriculum is very similar to that of certain other agricultural curricula in the first two years, in the junior and senior years emphasis has been placed upon courses which provide fundamental knowledge necessary for the attainment of the objectives of agriculture as formulated and approved by the Faculty of the Division of Agriculture.

Sufficient elective opportunity is provided in the junior and senior years to permit students to select sequences of courses in lines of work in which they are particularly interested. Electives are to be chosen in conference with the Dean. In general at least one-half of the total number of elective hours should be in a single field.

FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Composition		Composition		Composition	
Engl. 101 <sup>1</sup>	3	Engl. 102	3	Engl. 103	3
General Botany		General Zoology		Botany or Zoology	
Bot. 101	3	Zool. 114	3	Bot. 103 or Zool. 115	3
Crop Production		Crop Production		Farm Dairying	
F.C. 104	4	F.C. 105	4	D.I. 114	4
Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101	2	A.H. 102	2	A.H. 103	2
General Horticulture		General Chemistry		General Chemistry	
Hort. 114	3	Chem. 101	4	Chem. 102	4
Military 121	1	Military 122	1	Military 123	1
	<u>16</u>		<u>17</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Orientation, Ag. 101, 102; Ag. 104, see page 177.

SOPHOMORE YEAR

Gen. Agr. Economics		Gen. Agr. Economics		Gen. Agr. Economics	
Ec. 231	3	Ec. 232	3	Ec. 233	3
Qualitative Analysis		Organic and Quant.		Organic and Quant.	
Chem. 103	4	Chem. 255	3	Chem. 256	3
Mathematics		Physics		Farm Mach. & Power Mgt.	
Math. 205	4	Phys. 204	3	A.E. 334	4
Breeds of Livestock		Rural Landscape Design		Soils	
A.H. 205	4	L.A. 208	3	Soils 254	3
		Extempore Speaking		Technical Journalism	
		P.S. 311	3	T.JI. 225	3
Military 221	1	Military 222	1	Military 223	1
	<u>16</u>		<u>16</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

JUNIOR YEAR

Land Economics		Co-operation in Agric.		Farm Mgt. & Acctg.	
Ec. 334	3	Ec. 335	3	Ec. 336	3
General Genetics		General Bacteriology		Hay and Pasture Crops	
Gen. 800	3	Bact. 304A	5	F.C. 404	3
Principles of Sociology		Ec. Hist. of Agriculture <sup>1</sup>		Early 19th Century	
Ec. 384	3	Hist. 324	3	Engl. 254	3
American Government				Fertility and Fertilizers	
Govt. 315	3			Soils 354	5
Electives	5	Electives	6	Electives	3
	<u>17</u>		<u>17</u>		<u>17</u>

SENIOR YEAR

Agricultural Policy		Agricultural Finance		Animal Feeding	
Ec. 547	3	Ec. 535	3	A.H. 414	5
Soil Management		Farm Bldgs. and Equip.			
Soils 454	3	A.E. 489	3		
International Ec. Policies		Gen. Plant Pathology			
Hist. 568	3	Bot. 207	4		
Rural Social Organization					
Ec. 537	3				
Electives	5	Electives	7	Electives	12
	<u>17</u>		<u>17</u>		<u>17</u>

## Two-Year Collegiate Curriculum in Agriculture

The two-year collegiate curriculum in agriculture is offered to students who can meet the requirements for admission to the regular four-year college curricula but do not wish to take more than two years of college work.

On the satisfactory completion of this curriculum the student is granted a certificate.

In case a student decides later to complete the full four-year curriculum, he will receive credit toward his degree for the two years of work already completed.

For entrance requirements, see page 99.

## FIRST YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101 <sup>1</sup>	2	A.H. 102	2	A.H. 103	2
Crop Production		Crop Production		Farm Dairying	
F.C. 104	4	F.C. 105	4	D.I. 114	4
General Botany		General Chemistry		General Chemistry	
Bot. 101	3	Chem. 101A	4	Chem. 102A	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
Farm Mach. and Motors		General Horticulture		Farm Mechanics	
A.E. 334	4	Hort. 114	3	A.E. 254	2
Military 121	1	Military 122	1	Military 123	1
	<u>17</u>		<u>17</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Orientation, Ag. 101, 102.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SECOND YEAR

Breeds of Livestock		Breeds of Livestock		Breeds of Livestock	
A.H. 201	3	A.H. 202 or	3	A.H. 203	2
Principles of Breeding		Home Landscapes	or	Hay and Pasture Crops	
A.H. 454	3	L.A. 206	2	F.C. 404	3
Organic and Quant.		Farm Bldgs. and Equip.		Animal Feeding	
Chem. 255	3	A.E. 289	3	A.H. 414	5
Soils		Poultry Husbandry		Gen. Agr. Economics	
Soils 254	3	A.H. 144	3	Ec. 233	3
Gen. Agr. Economics		Fertility and Fertilizers		Military 223	1
Ec. 231	3	Soils 354	5	Electives	3
Military 221	1	Gen. Agr. Economics			
		Ec. 232	3		
		Military 222	1		
	<u>16</u>		<u>17 or 18</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

A student desiring a slightly different grouping of courses from that prescribed above will have the privilege of substituting with the approval of the heads of the departments concerned and the Dean of the Division, provided he can meet the standard prerequisites for that work.



### Practical Work

Administered by the head of the department in which the student elects to take the work.

Students of the Division of Agriculture must have at least six months of practical experience before graduation. This requirement should be met before the beginning of the junior year.

### Description of Courses

101, 102. **Orientation.** Lectures and class work designed to aid the first-year student to adjust himself to his environment, and to present a survey of the fields and opportunities in Agriculture. Fall, Winter. Required.

104. **Practical Work.** Six months required.

404. **International Aspects of Agriculture.** World production of agricultural products. World markets. Conditions affecting cost of production and marketing. Transportation costs. Competition and market requirements. International trade policies and prices. Winter, Spring. Lect. 2. Credit 2.

## AGRONOMY

P. E. BROWN, Head of Department

Professors Hughes, Stevenson; Associate Professors Firkins, Porter, Smith, Wentz; Assistant Professors Dorchester, Eldredge, Peterson, Richards, Thorne; Graduate Assistants Bolin, Davis; Fellows Johnston, Klingebiel

Extension Workers \*Boatman, \*Clapp, Hauser, Dyas, Burson, Watkins Kilpatrick.

*For information concerning the Division of Agriculture, see page 120.*

The curriculum in Agronomy is especially adapted for men who desire broad training in agriculture to enable them to carry out general farming operations successfully or who wish to prepare themselves for more or less highly specialized lines of work which require a fundamental working knowledge of general agriculture, particularly crop production and soil management.

Sufficient elective hours are provided so that in addition to the training in farm crops and soils, any student may specialize in some closely allied science line such as plant pathology, economic entomology, chemistry, botany, bacteriology, geology, rural sociology, or economics, or in any agricultural line such as agricultural economics, farm management, animal husbandry, horticulture, agricultural engineering, technical journalism, or vocational education. Carefully outlined groups of courses along these various lines are prepared for individual students so that elective hours may be utilized to the best advantage.

Over two hundred acres of land devoted to experimental work in farm crops and soils are available for use as laboratories in the various courses offered in the department. These laboratories afford students an unusual opportunity to study important problems in crop production and soil management

\*Absent on leave.

There is an increasing demand for men well trained in crops and soils, and each year the department is asked to recommend men for desirable positions as county agents, farm managers, extension workers for colleges and railroads, instructors in agriculture in colleges and high schools, investigators in government and state experimental work, assistants in seed houses and similar commercial concerns, and assistants on the editorial staffs of agricultural journals. There are many openings for men who, with a fundamental knowledge of crops and soils, have specialized in plant pathology, entomology and other lines.

### Curriculum in Agronomy

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 177.

For entrance requirements, see page 99.

#### FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Crop Production		Crop Production		Soils	
F.C. 104 <sup>1</sup>	4	F.C. 105	4	Soils 254	3
Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101	2	A.H. 102	2	A.H. 103	2
General Botany		Farm Mechanics		Farm Dairying	
Bot. 101	3	A.E. 254	2	D.I. 114	4
General Horticulture		General Chemistry		General Chemistry	
Hort. 114	3	Chem. 101	4	Chem. 102	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
Military 121	1	Military 122	1	Military 123	1
	16		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Orientation, Ag. 101, 102; Ag. 104, see page 177.

#### SOPHOMORE YEAR

Forage Crops		Crop Seed		Fertility and Fertilizers	
F.C. 214	4	F.C. 204	3	Soils 354	5
Breed Studies		Poultry Husbandry		Breed Studies	
A.H. 201	3	A.H. 144	3	A.H. 203	2
Qualitative Analysis		Organic and Quant.		Organic and Quant.	
Chem. 103	4	Chem. 255	3	Chem. 256	3
Gen. Agr. Economics		Gen. Agr. Economics		Gen. Agr. Economics	
Ec. 231	3	Ec. 232	3	Ec. 233	3
Extempore Speaking		Mathematics		Physics	
P.S. 311	2	Math. 205	4	Phys. 204	3
Military 221	1	Military 222	1	Military 223	1
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

#### JUNIOR YEAR

Gen. Plant Physiology		General Bacteriology		Crop Breeding	
Bot. 205	4	Bact. 304A	5	F.C. 504	4
Agricultural Geology		Farm Machinery		Gen. Plant Pathology	
Geol. 375	3	A.E. 334	4	Bot. 207	4
Embryogeny		General Genetics		Farm Insects	
Bot. 404	3	Gen. 300	3	Zool. 374	4
Technical Journalism		Electives	5	Electives	5
T.J. 225	3				
Electives <sup>4</sup>	4				
	17		17		17

SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Soil Management		Soil Bacteriology		Animal Feeding	
Soils 454	3	Soils 564	5	A.H. 414	5
Principles of Sociology		Economic History		Electives	12
Ec. 384	3	Hist. 324	3		
American Government		Electives	9		
Govt. 815	3				
Electives <sup>4</sup>	8				
	<hr/> 17		<hr/> 17		<hr/> 17

<sup>4</sup>The curriculum in Agronomy offers a considerable number of electives in the Junior and Senior years. This provision enables a student to take several elective courses in some other line of agriculture or allied science and thus prepare himself for special work in a chosen field or for an advanced degree in that field. Electives must be chosen in consultation with the counselor, and the student should elect at least 10 hours in Farm Crops and Soils and at least 15 hours in some closely allied science lines such as Entomology, Chemistry, Plant Pathology, Geology, Rural Sociology, etc., or in some agricultural lines such as Vocational Education, Agricultural Economics, etc. Free electives may be chosen for the remaining 18 hours available.

The following electives are suggested for students who plan to pursue graduate studies later: M.L. 411, 412, 413 or 441, 442, 443; Math. 405, 406; Physics 211, 212, 213; Chem. 201, 202, 274; Bot. 206, 405, 406, 554.

Description of Courses

For description of non-collegiate courses, see page 345.

Farm Crops Group

104. Crop Production. Fundamental underlying principles of crop production; world crop distribution with causes; growth processes; crop plant response to environment. Fall, Winter. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4.

105. Crop Production. The principles considered in 104 are applied in a specific study of corn and small grains including their distribution, use, improvement, growth, harvesting, and marketing. Prerequisite: 104. Winter, Spring. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4.

204. Crop Seed. Seed as related to yield. Selection, improvement, showing, and judging farm seed. Prerequisite: 105. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

214. Forage Crops. Grasses, legumes and other plants used for forage, pasture, silage, soiling and green manures. Prerequisite: 105. Fall, Spring. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4.

301, 302, 303. Seminar. Fall, Winter, Spring, respectively. Credit 1 each quarter.

304, 305. Commercial Crop Judging and Grading. Judging and grading cereal and forage crops, with particular emphasis on market classes and grades. (304) Prerequisite: 204. Spring. Rec. and lab. 3, 2 hr. Credit 3. (305) Prerequisite: 304. Fall. Rec. and lab. 2, 2 hr. Credit 2.

324. General Farm Crops. Underlying causes of world, United States, and Iowa crop distribution; growth processes and requirements of crop plants; production and use of grain and forage crops. Fall. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4.

344. Seed Analysis. (Bot. 344.) Principles and practices of purity analyses; identification, classification, and characteristics of seeds in different families. Prerequisite: Bot. 102. Fall. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

404. Hay and Pasture Crops. Major problems connected with meadow and pasture management. Specific grass, legume, and miscellaneous crops for forage purposes. Prerequisite: 105. Spring. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3.

410. Agricultural Travel Course. (A.H. 410.) A tour and study of the major livestock and crop regions of the United States. The influence of climate, soil, topography, markets, and other factors on the livestock and crops produced. Methods of production and management. A few days will be required for a preliminary study prior to the trip. At the end of the tour some time will be devoted to a summary and review. Summer, first term. Credit 8 or may be divided equally with A.H. 410.

414. Crop Management. Solution of practical crop problems through the application of investigational data available. Prerequisite: 214. Winter. Rec. 3. Credit 3.

424. Fiber, Sugar, and Root Crops. Production and manufacture of cotton, flax, sisal, and other fibers; also sugar beets, sugar cane, mangels, and other root crops. Prerequisite: 105. Spring. Rec. 2. Credit 2.

435. **Problems in Farm Crops.** Prerequisite: 204, 214. Fall. Credit 3 to 6.
445. **Seed Viability.** (Bot. 445.) Principles and practices of seed germination. Factors affecting viability; physiology of germination. Prerequisite: Bot. 205. Winter. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.
504. **Cereal and Forage Crop Breeding.** The application of principles of genetics and allied subjects to the improvement of field crops. Prerequisite: Gen. 300. Spring. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4. Mr. Wentz.
546. **Seed Borne Diseases.** (Bot. 546.) Detection, identification, and control of parasitic organisms carried by crop seeds. Prerequisite: Bot. 207. Spring. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3. Mr. Porter.
604. **Research Methods in Crop Investigations.** Planning, conducting, and interpreting research work in field crops. Winter. Rec. 3. Credit 3. Mr. Wentz.
605. **Taxonomy of Field Crops.** The identifying characters of field crops and their varieties with practice in classification. Spring. Rec. and lab. 2, 2 hr. Credit 2. Mr. Dorchester.
640. **Research.**
- A. Crop Production Mr. Hughes, Mr. Wilsie.
  - B. Crop Breeding. Messrs. Wentz, Burnett, Bryan, Rhoades.
645. **Conferences.** Reports and discussions on current investigations. Fall, Winter, Spring. Credit 1 each quarter.
- A. Crop Production. Mr. Hughes.
  - B. Crop Breeding. Mr. Wentz.

### Soils Group

254. **Soils.** Identification, mapping, and description of soil types; origin and classification. Soil areas, types, and problems in Iowa. Fall, Spring. Rec. 2. Lab. 2, 2 hr. Credit 3.
264. **Soils and Soil Fertility.** Origin and classification of soils; principles of fertility and a study of fertilizer requirements of soils. Winter, Spring. Rec. 3. Credit 3.
354. **Soil Fertility and Fertilizers.** General principles of fertility. Studies on samples of soil from the home farm; commercial fertilizers, incomplete and complete, influence on soil fertility. Prerequisite: 254, Chem. 255, or equivalent and credit or classification in Chem. 256 or 253 when required in the curriculum. Winter, Spring. Rec. 3. Rec. and lab. 2, 2 hr. Credit 5.
374. **Forest Soils.** Physical, chemical, and biological soil factors affecting forest growth. Prerequisite: 254. Winter. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3.
- 401, 402, 403. **Seminar.** Fall, Winter, Spring, respectively. Credit 1 each quarter.
436. **Soil Erosion Control.** (A.E. 436). (For. 436). Field work to study soil type characteristics by profiles, to map selected areas, certain farms and eroded lands. Forests in relation to watershed protection and erosion control; trees used; methods of planting and protection. Engineering aspects of soil erosion and its control; soil saving checks and dams; terracing. Prerequisite: Soils 254 (except for agricultural engineering students). Summer, 10 weeks, credit 10 or may be divided with Ag. Engr. and/or For.
454. **Soil Management.** Productiveness of particular types or classes of soils; utilization; soil conservation; special soils. Prerequisite: 354. Fall, Spring. Rec. 3. Credit 3.
464. **Soil Conservation and Erosion Control.** Fundamental principles involved in the conservation of the land and in the prevention and control of erosion, as applied to Iowa. Prerequisite: 254. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.
474. **Field Study of Soils.** Field work in five or six locations in Iowa in the different soil areas to study soil type characteristics by profiles, to map selected areas, certain farms and eroded lands and to evaluate land from the soils standpoint. Prerequisite: 254. Summer, first term. Credit 8.
475. **Problems in Soils.** Prerequisite: 354. Spring. Credit 3 to 6.
554. **Advanced Soils.** Classification of soils, constitution and formation of the soil profile and the properties of the clay and organic matter complexes. Prerequisite: 354. Fall. Rec. 3. Credit 3. Mr. Smith.
564. **Soil Bacteriology.** (Bact. 564.) Occurrence and activities of soil bacteria and their influence on soil fertility. Prerequisite: Bact. 304A and credit or classification in 354. Winter. Rec. 3. Lab. 3, 2 hr. Credit 5. Mr. Brown.
654. **Advanced Soil Physics.** Physical characteristics of soils. Spring. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3. Mr. Richards.

664. **Advanced Soil Fertility.** Influence of various factors on the productive power of soils. Fertilizing materials and their effect on soils. Winter. Rec. 3. Rec. and lab. 2, 2 hr. Credit 5. Mr. Smith.

674. **Advanced Soil Bacteriology.** (Bact. 674.) The occurrence and activities of bacteria, molds, protozoa, and algae in soils and their functions. Spring. Rec. 3. Rec. and lab. 2, 2 hr. Credit 5. Mr. Brown.

690. **Research.**

A. Soil Bacteriology (Bact. 690A). Mr. Brown.

B. Soil Fertility. Mr. Brown, Mr. Smith.

C. Soil Physics and Soil Surveying. Messrs. Brown, Firkins, Richards.

D. Soil Management. Mr. Brown, Mr. Stevenson.

695. **Conferences.** Reports and discussions on current investigations. Fall, Winter, Spring. Credit 1 each quarter.

A. Soil Bacteriology. (Bact. 695A.) Mr. Brown.

B. Soil Fertility. Mr. Brown.

C. Soil Physics. Mr. Brown.

D. Soil Management. Mr. Brown.

## ANIMAL HUSBANDRY

P. S. SHEARER, Head of Department

Professors Caine, Cannon, Helser, Henderson, LaGrange, Lush, Thomas, Wilcke; Associate Professors Anderson, Hansen; Assistant Professors Beard, Espe, Holbert, Waters; Instructors Milby, Pease;

Graduate Assistant Dickey

Extension Workers Arnold, Beresford, Johnston, McDonald, Quaife, Porter, Vernon, Whitfield

*For information concerning the Division of Agriculture, see page 120.*

The department of Animal Husbandry offers instruction and carries on experimental work in the selection, breeding, feeding, management, and marketing of the various breeds and classes of farm animals, in the killing of meat animals and in cutting and curing of meats.

The work of the department is divided into three main groups: Animal Husbandry, Dairy Husbandry, and Poultry Husbandry. Students have the opportunity to make a choice of their major line of work from these three groups. There are sufficient elective hours for a minor in related fields as agricultural economics, agronomy, vocational education, technical journalism, chemistry, and others.

Graduates in animal husbandry find employment in many lines of work. A few of the many branches open to such graduates are: stock farm management, college work, experiment station work, government work, extension work for colleges, railroads, and breed associations, positions as county agents, agricultural high school work, agricultural journalism with particular reference to livestock, sales positions with commission firms, buying for packers, selling feed stuffs and stock farm equipment.

Some of the openings for graduates who have specialized in dairy husbandry are: dairy farm management, college and experiment station work, positions in United States Department of Agriculture, extension work, county and club agents, high schools, breed association work, agricultural journalism with particular reference to dairy cattle, management and sales positions with firms handling feed stuffs and dairy farm equipment.

Graduates of the Poultry Industry curriculum are in demand in the produce packing industry and as commercial hatchery managers.

Poultry Husbandry graduates are especially fitted for turkey, chicken, or game farm managers. Graduates of either curriculum may find opportunities in government research, state college experiment station or extension work; as technical specialists with poultry feed, equipment, or incubator manufacturers; with railroads, large land operators, or farm magazine publishers.

### Curriculum in Animal Husbandry

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 177.

For entrance requirements, see page 99.

#### FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101 <sup>1</sup>	2	A.H. 102	2	A.H. 103	2
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
Livestock Management		General Chemistry		General Chemistry	
A.H. 125	2	Chem. 101	4	Chem. 102	4
Crop Production		Crop Production		Farm Mechanics	
F.C. 104	4	F.C. 105	4	A.E. 254	2
General Botany		General Horticulture		Farm Dairying	
Bot. 101	3	Hort. 114	3	D.I. 114	4
Military 121	1	Military 122	1	Military 123	1
	<u>15</u>		<u>17</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech.Lect., A.H. 110 (Spring); Orientation Ag. 101, 102; Ag. 104, see page 177.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

#### SOPHOMORE YEAR

Breeds of Livestock		Breeds of Livestock		Breeds of Livestock	
A.H. 201	3	A.H. 202	3	A.H. 203	
(1) Poultry Husbandry		(3) Mathematics		(4) Farm Meats	
A.H. 144	3	Math. 205	4	A.H. 270	
General Chemistry		Organic and Quant.		Organic and Quant.	
Chem. 103	4	Chem. 255	3	Chem. 256	
(2) Anat. Dom. Animals		General Zoology		General Zoology	
Vet.Anat. 217	3	Zool. 114	3	Zool. 115	
Gen. Agr. Economics		Gen. Agr. Economics		Gen. Agr. Economics	
Ec. 231	3	Ec. 232	3	Ec. 233	
Military 221	1	Military 222	1	(5) Physics	
				Physa. 204	
				Military 223	
	<u>17</u>		<u>17</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Physa.Ed. 201, 202, 203.

(1) A.H. 144—Offered Fall, Winter, Spring.

(2) Two-thirds of Sophomore students will take Vet.Anat. 217 in Fall and one-third in Winter.

(3) Two-thirds of the students will take Math. 205 in Fall and one-third in Winter.

(4) A.H. 270—Offered Winter, Spring.

(5) One-third of the students will take Physa. 204 in Winter Quarter and two-thirds in Spring.

## JUNIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Animal Nutrition		General Bacteriology		Livestock Judging	
A.H. 318	3	Bact. 304A	5	A.H. 305	2
Comparative Physiology		General Genetics		Animal Breeding	
Vet.Phys. 364	3	Gen. 300	3	A.H. 350	3
Embryology		Fertility and Fertilizers		Farm Machinery	
Zool. 384	3	Soils 354	5	A.E. 334	4
Soils		†Electives	4	Economic History	
Soils 254	3			Hist. 324	3
Principles of Sociology				Extempore Speaking	
Ec. 384	3			P.S. 311	2
†Electives	2			†Electives	3
	<hr/> 17		<hr/> 17		<hr/> 17

## SENIOR YEAR

Market Classes & Grades of Livestock		Milk Production		Prod. & Mktg. of Horses	
A.H. 409	2	A.H. 434	2	A.H. 424	2
Prod. & Mktg. of Sheep		Pork Prod. & Mktg.		Prod. & Mktg. of Beef Cattle	
A.H. 429	2	A.H. 425	3	A.H. 427	3
American Government		Herd Book Study		Pasture and Hay Crops	
Govt. 315	3	A.H. 460	3	F.C. 404	3
Soil Management		Farm Bldgs. & Equip.		†Electives	3
Soils 454	3	A.E. 489	3		
†Electives	7	†Electives	6		
	<hr/> 17		<hr/> 17		<hr/> 17

The curricula in Animal Husbandry, Dairy Husbandry, Poultry Husbandry, and Poultry Industry offer a considerable number of electives in Junior and Senior years. This provision enables a student to take several electives in some other line of agriculture or allied science and thus prepare himself for special work in a chosen field, or for work for an advanced degree in that field. Electives are to be chosen in conference with the senior college counselors and the head of the department. The department has prepared groups of elective sequences leading to definite objectives: as for example, a group of courses in Vocational Education and Psychology, Chemistry and Physiology, Agricultural Economics, English, Technical Journalism, Entomology, etc. Where such a sequence requires as much as 30 credits, the student with the consent of his counselor and classifying officer, and the approval of the Substitution Committee may substitute for enough credits to make the sequence possible.

For information concerning the Reserve Officers' Training Corps, see page 301.

## Curriculum in Dairy Husbandry

Leading to the degree of Bachelor of Science.

Dairy Husbandry freshmen and sophomores should register in the Dairy Husbandry curriculum. During the freshman and sophomore years they will take the same courses as the Animal Husbandry students. See page 182.

## JUNIOR YEAR

General Bacteriology		Principles of Sociology		Adv. Study Dairy Breeds	
Bact. 304A	5	Ec. 384	3	A.H. 335A	4
Comparative Physiology		Dairy Bacteriology		Animal Breeding	
Vet.Phys. 364	3	D.I. 350	4	A.H. 350	3
Embryology		General Genetics		Fertility and Fertilizers	
Zool. 384	3	Gen. 300	3	Soils 354	5
Soils		Extempore Speaking		Economic History	
Soils 254	3	P.S. 311	2	Hist. 324	3
Electives	3	American Government		Electives	2
		Govt. 315	3		
		Electives	2		
	<hr/> 17		<hr/> 17		<hr/> 17

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Animal Nutrition		Dairy Farm Problems		Manufacture of Butter	
A.H. 318	3	A.H. 536	5	D.I. 304	5
Prod. and Mktg. Horses		Seminar		Market Milk	
A.H. 424	2	A.H. 439	1	D.I. 305	3
Soil Management		Pork Prod. & Mktg.		Pasture and Hay Crops	
Soils 454	3	A.H. 425	3	F.C. 404	3
Milk Secretion		Electives	8	Electives	6
A.H. 585	2				
Electives	7				
	<hr/> 17		<hr/> 17		<hr/> 17

## Curricula In Poultry Husbandry and in Poultry Industry

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 177.

For entrance requirements, see page 99.

## FRESHMAN YEAR

Poultry Husbandry		Management of Poultry		Packing Plant Problems	
A.H. 144 <sup>1</sup>	3	A.H. 145	3	A.H. 146	3
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
General Chemistry		General Chemistry		General Chemistry	
Chem. 101	4	Chem. 102	4	Chem. 103	4
Farm Dairying		Farm Mechanics		Livestock Problems	
D.I. 114	4	A.E. 254	2	A.H. 103	2
Military 121	1	General Zoology		General Zoology	
		Zool. 114	3	Zool. 115	3
		Military 122	1	Military 123	1
	<hr/> 15		<hr/> 16		<hr/> 16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., A.H. 110 (Spring); Orientation Ag. 101, 102; Ag. 104, see page 177.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

Organic and Quant.		Hatchery Operations		Brooding	
Chem. 255	3	A.H. 245	3	A.H. 246	3
Princ. of Economics	}	Organic and Quant.		Farm Meats	
*Ec. 201 or		Chem. 256	3	A.H. 270	3
Gen. Agr. Economics	}	Princ. of Economics	}	Princ. of Economics	}
*Ec. 231		**Ec. 202 or		**Ec. 203 or	
Extempore Speaking		Gen. Agr. Economics	3	Gen. Agr. Economics	3
P.S. 311	2	*Ec 232		*Ec. 233	
Anat. of Dom. Animals		General Botany	}	Elementary Accounting	
Vet. Anat. 217	3	*Bot. 101 or		Ec. 370	3
Livestock Problems	}	Milk Test. & Inspect.	3	Physics	
*A.H. 101 or		**D.I. 116		Phys. 204	3
Electives		Livestock Problems	}	Military 223	1
Mathematics		*A.H. 102 and			
Math. 205	4	General Horticulture			
Military 221	1	*Hort. 114 or	5		
		Dairy Machinery			
		**A.E. 239			
		Military 222	1		
	<hr/> 18		<hr/> 18		<hr/> 16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

\*For Poultry Husbandry students.

\*\*For Poultry Industry students.



## JUNIOR YEAR

Fall Quarter	Credits <sup>2</sup>	Winter Quarter	Credits	Spring Quarter	Credit
Poultry Judging		Incubation		Poultry Nutrition	
A.H. 846	3	A.H. 845	3	A.H. 546	3
Comp. Physiology		Principles of Sociology		Sp. Poultry Bact.	
Vet. Phys. 864	3	Ec. 384	3	Bact. 574	3
General Bacteriology		Animal Nutrition		Soils	
Bact. 804A	5	*A.H. 818 or	3	*Soils 254 or	
General Farm Crops		Dairy Bacteriology	or	Creamery Acetg.	3
F.C. 824	4	**Bact. 850	4	**Ec. 880	
Electives	3	Embryology		Manuf. of Butter	
		Zool. 284	4	**D.I. 804 or	
		Food Chemistry	4	Electives	
		**Chem. 845 or	or	Market Milk	
		*Electives	3	**D.I. 805 or	
				Electives	
	18		17		17

\*For Poultry Husbandry students.

\*\*For Poultry Industry students.

## SENIOR YEAR

Market Poultry		Poultry Breeding		Commercial Poultry Prod.	
A.H. 440	4	A.H. 548	3	A.H. 449	3
General Genetics		Economic History		Technical Advertising	
Gen. 300	3	Hist. 324	3	T.J. 325	2 or 3
Poultry Seminar		Poultry Seminar		Poultry Seminar	
A.H. 541	1	A.H. 542	1	A.H. 548	1
American Government		*Fertility and Fertilizers		Poultry Sanitation	
Govt. 815	3	Soils 854	5	Vet. Hyg. 428	2
Electives	6	Electives	5	Electives	9 or 8
	17		17		17

Electives for Poultry Industry students: Agr. Engineering 157; Bacteriology 534, 535, 587; Chemistry 347; Economics 365, 234, 304, 335, 366, 374, 474; English 205, 404, 405; Mathematics 101, 102A, 108, 211, 212, 213, 441, 442, 448; Public Speaking 312, 334.

## Description of Courses

For description of non-collegiate courses, see page 345.

**101. Livestock Problems.** The relation of livestock to agriculture and to human needs. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. Beef and dual-purpose cattle. (A) For students who have not had one year of vocational or 4-H Club training. Fall. (B) For students who have had at least one year of 4-H Club or vocational training. Fall. Rec. and lab. 2, 2 hr. Credit 2.

**102. Livestock Problems.** Sheep and horses. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. (A) For students who have not had one year of vocational or 4-H Club training. (B) For students who have had at least one year of vocational or 4-H Club training. Winter. Rec. and lab. 2, 2 hr. Credit 2.

**103. Livestock Problems.** Dairy cattle and hogs. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. Spring. Rec. and lab. 2, 2 hr. Credit 2.

**107. Market and Breed Types of Livestock.** Beef, dairy and dual-purpose cattle, sheep, horses, and hogs. Judging and selection. Spring. Rec. and lab. 6, 2 hr. Credit 6.

**110. Technical Lecture.** A survey of the field of Animal Husbandry. For Freshman Animal Husbandry students. Spring. Lect. 1. Required.

**125. Livestock Management.** Fitting for show and sale. Fall, Spring. Lect. and lab. 2, 2 hr. Credit 2.

**144. General Poultry Husbandry.** Principles of managing a farm flock. Selection of breeds, culling, fitting, judging, and housing. Fall, Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

**145. Management of Poultry.** Studies of the production of turkeys, ducks, geese, pheasants, capons, and other fowl; their origin, habits, and utility. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

**146. Poultry Packing Plant Problems.** Factors affecting the quality of market poultry and eggs. Grading and candling eggs. Prerequisite: 144. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

**201, 202, 203. Breeds of Livestock.** Breeds, their use and adaptability in commercial livestock production. (201) Dairy cattle and hogs. Prerequisite: 103. Fall. Lect. 1. Rec. and lab. 2, 2 hr. Credit 3. (202) Sheep and horses. Prerequisite: 102. Winter. Lect. 1. Rec. and lab. 2, 2 hr. Credit 3. (203) Beef and dual-purpose cattle. Prerequisite: 101. Spring. Rec. and lab. 2, 2 hr. Credit 2.

**205. Breeds of Livestock.** Their use and adaptability in commercial livestock production. Prerequisite: 101, 102, 103. Fall. Lect. 1. Rec. and lab. 3, 2 hr. Credit 4.

**245. Hatchery Operation.** Practice in operating mammoth incubators. Principles of modern hatchery management. Selecting, boxing, and shipping chicks. Prerequisite: 244. Winter. Rec. and lab. 6 hrs. Credit 3.

**246. Brooding.** Principles and practices; study of brooders and principles and practices of artificial brooding. Prerequisite: 146. Spring. Rec. 2 for first 8 weeks of quarter. Lab. 4 weeks, 1 hr. daily. Credit 3.

**270. Farm Meats.** The selection and killing of meat animals and the cutting and curing of farm meats. Prerequisite: Vet. Anat. 217. Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

**305. Livestock Judging.** Horses, beef cattle, sheep, and hogs. Prerequisite: 201, 202, 203, and Vet. Anat. 217. Spring. Lab. 2, 3 hr. Credit 2.

**318. Animal Nutrition.** Fundamental basis of nutrition; practical methods; nutritive ratios and feeding standards. Prerequisite: Chem. 253 or 256, and Vet. Anat. 217. Credit or classification in Vet. Phys. 364. Fall, Winter. Lect. 3. Credit 3.

**334. Dairy Farm Practice.** Practical problems of breeding, feeding, and management. Open by permission to men doing cow testing association work. Credit given after satisfactory completion of one year's work as tester in a cow testing association in Iowa. Prerequisite: 101, 102, 103, and D. I. 114. Credit 6.

**335. Advanced Study of the Dairy Breeds.** Judging, compiling pedigrees, selection of breeding animals, studies of important strains and families, trips to dairy cattle farms. Prerequisite: 201, Vet. Anat. 217. (A) Spring. Rec. 2. Lect. and lab. 2, 2 hr. Credit 4. (B) Spring. Lect. and lab. 2, 2 hr. Credit 2.

**337. Dairy Cattle Feeding and Management.** For Dairy Industry students. Feeding, care, management, and development of dairy cattle; methods of milk production. Prerequisite: Chem. 175 or 251. Fall. Rec. 3. Credit 3.

**344. Special Poultry Problems.** Experimentation, technique, practice. Prerequisite: credit or classification in 15 hrs. of poultry husbandry. Fall, Winter, Spring. Credit 3.

**345. Incubation.** Factors affecting the development and hatching of avian embryos. Prerequisite: 245, credit or classification in Zool. 234 or 334. Winter. Rec. 2. Lab. ½ hr. daily. Credit 3.

**346. Poultry Judging.** History and development of breeds and varieties. Prerequisite: 144, 146. Fall. Rec. 1. Lab. 3, 2 hr. Credit 3.

**350. Animal Breeding.** Application of principles of genetics to improvement of farm animals; methods and problems of the breeder. Prerequisite: 201, 202, 203, Zool. 334, and Genetics 300. Winter, Spring. Lect. 3. Credit 3.

**374. Farm Meats.** For Home Economics students. Selecting, cutting, and curing of meat in the farm and city home. Spring. Lect. 1. Lab. 1, 3 hr. Credit 2.

**376. Farm Meats.** For Junior and Senior Veterinary students. The selection, and killing of meat animals and the cutting and curing of farm meats. Prerequisite: 107, Vet. Anat. 213. Spring. Lect. 1. Lab. 1, 3 hr. Credit 2.

**405. Advanced Live Stock Judging.** Horses, beef cattle, sheep, and hogs. Trips to shows and stock farms. Prerequisite: 305. Fall. Lab. 6 hrs. Credit 2.

**409. Market Classes and Grades of Livestock.** Classifying, grading, and valuing horses, cattle, sheep and hogs from the standpoint of the market. Prerequisite: 101, 102, 103, and Vet. Anat. 217. Fall, Spring. Lect. and lab. 3, 1 hr. Credit 2.

**410. Agricultural Travel Course.** (F. C. 410). A tour and study of the major livestock and crop regions of the United States. The influence of climate, soil, topography, markets, and other factors on the livestock and crops produced. Methods of production and management. A few days will be required for a preliminary study, prior to the trip. At the end of the tour some time will be devoted to a summary and review. Summer, first term. Credit 8, or may be divided equally with F. C. 410.

414. **Animal Feeding.** Composition and digestibility of feeding stuffs; preparation; feeding standards and calculation of rations; management of herds and flocks. Prerequisite: Chem. 255, or equivalent. Spring. Lect. 5. Credit 5.

416. **Animal Feeding.** Similar to 414. Prerequisite: Chem. 107, 174, 251, or 255. Rec. 3. Credit 3. Spring.

424. **Horse Production and Marketing.** Prerequisite: 318, Vet. Phys. 364. Fall, Spring. Rec. 2. Credit 2.

425. **Pork Production and Marketing.** Prerequisite: 318, Vet. Phys. 364. Winter, Spring. Lect. 3. Credit 3.

427. **Beef Cattle Production and Marketing.** Prerequisite: 318, Vet. Phys. 364. Fall, Spring. Lect. 3. Credit 3.

429. **Mutton and Wool Production and Marketing.** Prerequisite. 318, Vet. Phys. 364. Fall, Spring. Lect. 2. Credit 2.

430. **Special Problems in Dairy Husbandry.** Open to students who can show satisfactory preparation for the problem chosen and who have earned a quality point average of 2.5 or above for the two preceding quarters. Individual topic, conferences, and preparation of a report. Fall, Winter, Spring. Credit 3 each quarter.

434. **Milk Production and Herd Management.** For Animal Husbandry students. Preparation of feeds; computing rations for milking herd, young stock, and sire. Management of specialized and general dairy farms. Prerequisite: 318. Fall, Winter. Rec. 2. Credit 2.

439. **Dairy Husbandry Seminar.** For Seniors. Selected subjects; recent investigations. Winter. Credit 1.

440. **Marketing of Poultry and Eggs.** Fattening, killing, dressing, grading, and shipping market poultry; candling, grading, and packing eggs for shipment. Trips to commercial plants and study of poultry packing plant operations. Prerequisite: 146. Alternate years. Offered Fall, 1938. Rec. 2. Lab. 2, 3 hr. Credit 4.

449. **Commercial Poultry Production.** Practical problems. Plans, development, and organization of commercial poultry farms. Visits to several commercial poultry farms required. Prerequisite: 345. Alternate years. Offered Spring, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3.

454. **Principles of Breeding.** Physical basis of heredity; Mendelism; livestock breeding. Prerequisite: 101, 102, 103, or 107. Fall. Lect. 3. Credit 3.

460. **Herd-Book Study.** Pedigrees, blood lines and families in various breeds of livestock. Prerequisite: 201, 202, 203; credit or classification in 350. Fall, Winter. Lect. 2. Lab. 1, 3 hr. Credit 3.

475. **Meats and Meat Products.** For Home Economics students. Special problems in the judging, buying and handling of meats. Prerequisite: 374 or equivalent. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

480. **Animal Husbandry Seminar.** For Senior Animal Husbandry students. Practical investigations covered. Selected review topics. Spring. Rec. 2. Credit 2.

490. **Special Problems in Animal Husbandry.** Open to Senior College students who can show satisfactory preparation for the problem chosen and who have earned a quality point average of 2.5 or above for the two preceding quarters. Individual topic, conferences, and preparation of a report. Fall, Winter, Spring. Credit 3 each quarter.

535. **Milk Secretion.** Principles of nutrition in their relation to milk secretion. Prerequisite: 318, Vet. Phys. 364. Fall. Rec. 2. Credit 2. Mr. Espe.

536. **Dairy Farm Problems.** Production of milk; care, feeding, housing, and management of dairy cattle with experimental results and their application to dairy husbandry. Prerequisite: 318, 350. Winter. Rec. 5. Credit 5. Mr. Cannon.

541, 542, 543. **Poultry Seminar.** Reviews and reports of current literature and investigations. Fall, Winter, Spring, respectively. Credit 1 each course. Mr. Wilcke.

546. **Poultry Nutrition.** Experimental work; poultry rations; egg production, development of young stock. Prerequisite: 146, Chem. 256, Vet. Phys. 364. Alternate years. Offered Spring, 1939. Lect. 1, Lab. 2, 3 hr. Credit 3. Mr. Henderson, Mr. Wilcke.

548. **Poultry Breeding.** Principles of genetics as applied to poultry. Inheritance of commercial factors including size of body, size of egg, egg production, hatchability of eggs, and viability of chicks. Breeding records and pedigreeing. Selection and mating of breeding hens. Prerequisite: 345, Gen. 300. Alternate years. Offered Winter, 1939. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Waters.

600. **Research in Animal Nutrition.** Mr. Thomas, Mr. Culbertson.

605. **Conference in Experimental Methods in Animal Husbandry.** Research methods, selection of problems, planning of experimental work, execution of program, interpretation of results and presentation of material. Fall, Winter, Spring. Credit 2. Mr. Culbertson.

614. **Seminar in Animal Nutrition.** Prerequisite: Chem. 575 or equivalent. Fall, Winter, Spring. Credit 1. Mr. Thomas.

615. **Research in Animal Production.** Messrs. Shearer, Caine, Anderson, Culbertson.

630. **Dairy Husbandry Experimentation.** Experimental methods, criticism of problems. Fall. Credit 1. Mr. Cannon.

638. **Research in Dairy Husbandry.** Messrs. Cannon, Hansen, Espe.

640. **Research in Poultry Husbandry.** Messrs. Henderson, Waters, Wilcke.

650. **Research in Animal Breeding.** Mr. Lush, Mr. Shearer.

651, 652, 653. **Conferences on Animal Breeding Systems.** (Gen. 651, 652, 653.) Biometric relations between parent and offspring, inbreeding and outbreeding, assortative mating, the effects of selection. Application of these principles to progeny tests, selection indices, records of performance, etc. Prerequisite: 350, Gen. 600. or equivalent. Fall, Winter, Spring, respectively. Credit 2 each course. Mr. Lush.

670. **Research in Meats.** Mr. Helser.

680. **Seminar.** Weekly meetings with staff. Fall, Winter, Spring. Credit 1. Messrs. Cannon, Lush, Thomas, Wilcke.

## ARCHITECTURAL ENGINEERING

A. H. KIMBALL, Head of Department

Associate Professor Bowers; Assistant Professor Phillips;  
Instructors Ayres, Woody

*For information concerning the Division of Engineering, see page 125.*

The curriculum in Architectural Engineering is designed to meet the growing demand for training in the fundamentals of engineering problems found in connection with architectural work and a knowledge of the aesthetic treatment of structures. It gives a groundwork in mathematics and applied mechanics, and includes such studies as strength of materials, mill, and tall building construction, reinforced concrete, etc. The principles of these subjects are applied to all forms of building construction in the work of the junior and senior years. While specializing in construction, this curriculum includes also the study of the forms and principles of architecture through such courses as freehand drawing, architectural history, architectural drawing, and architectural design.

In all professional work, the methods of instruction are, as far as possible, individual. Design is taught on the basis of problems requiring a solution, development and presentation by the student under criticism, accompanied by short problems to be carried out, with no criticism until all problems are turned in. The problems are treated from three standpoints; namely: practical planning, economic use of materials, and aesthetic treatment. In all cases, student design problems are graded by a jury consisting of the entire staff of the department.

Nine quarter credits of elective work are permitted in both the junior and senior years. The choice of the electives is to be made in consultation with the student's counselor and the head of the department. Certain sequences will then be arranged to fit the individual requirements

of the student and care will be exercised in order to use the time to the best advantage.

The training offered in the curriculum is such as to provide men with the best possible foundation for responsible positions in the profession.

All drawings and designs made during the curriculum become the property of the department to be retained, published, exhibited, or returned at the discretion of the department.

### Curriculum In Architectural Engineering

Leading to the degree of Bachelor of Science.

For graduate work, see page 149.

For entrance requirements, see page 99.

#### FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		Architectural Drawing	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Arch.E. 110	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		Plane Analytic Geometry	
Math. 101	5	Math. 102C	4	Math. 103	5
Drawing and Projection		Theory of Project. Draw.		Freehand Drawing	
Engr.Dr. 181	2	Engr.Dr. 182	3	Arch.E. 114	3
Engineering Problems		Engineering Problems			
Gen.E. 104	1	Gen.E. 105	1		
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	<u>16</u>		<u>16</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Lib. 106C (Winter); Arch.E. 100 (Spring).

#### SOPHOMORE YEAR

Elements & Composition		Arch. Engr. Design		Arch. Engr. Design	
Arch.E. 271A	2	Arch.E. 272A	3	Arch.E. 273A	3
Freehand Drawing		Freehand Drawing		Freehand Drawing	
Arch.E. 221	1	Arch.E. 222	2	Arch.E. 232	1
Surveying		Freehand Drawing		Statics of Engineering	
C.E. 325	3	Arch.E. 281	1	T.&A.M. 274	3
Extempore Speaking		Expository Writing		Engineering Problems	
P.S. 311	2	Engl. 204	2	Gen. E. 206	1
Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Mechanics and Heat		Elect. and Magnetism		Sound and Light	
Phys. 221	5	Phys. 222	5	Phys. 223	5
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	<u>18</u>		<u>18</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## JUNIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
History of Architecture		History of Architecture		History of Architecture	
Arch.E. 351	3	Arch.E. 352	3	Arch.E. 353	3
Arch. Engr. Design		Arch. Engr. Design		Arch. Engr. Design	
Arch.E. 381A	4	Arch.E. 382	4	Arch.E. 383	4
Mechanics of Materials		Elements of Structures		Industrial Buildings	
T.&A.M. 324	5	C.E. 335	5	C.E. 336	5
Materials Laboratory		Principles of Economics		Cement and Concrete	
T.&A.M. 327	1	Ec. 261	3	T.&A.M. 338	3
Properties of Materials		†American Government		Electives	
T.&A.M. 334	2	Govt. 315	3		
*Electives	3				
	<hr/> 18		<hr/> 18		<hr/> 18

†May be omitted by students appointed to the Reserve Officers Training Corps, see page 301.

\*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior and Senior years.

Junior elective courses shall be chosen, after consultation with the counselor, from the following approved sequences: C.E. 321, 322, 323; Govt. 315, 424, 435; Military 301, 302, 303; Mod.Lang. 441, 442, 443; Arch.E. 284, 285, 286; Arch.E. 325, 326, 327; Ec. 304, 365; Engl. 304, 305; P.S. 312, 313.

## SENIOR YEAR

Commercial Bldg. Design		Building Construction		Special Bldg. Problems	
Arch.E. 491	4	Arch.E. 492	5	Arch.E. 493	4
Reinforced Concrete		Multistory Buildings		Professional Relations	
C.E. 437	5	C.E. 438	3	Arch.E. 494	3
Mech. Equip. of Bldgs.		Mech. Equip. of Bldgs.		Adv. Struct. Analyses	
M.E. 407	3	M.E. 409	3	C.E. 439	5
City or Town Planning		Engineering Contracts		Seminar	
L.A. 401	3	Engr. 405	3	Arch.E. 495	R
Inspection Trip		Electives	4	Engineering Valuation	
Arch.E. 400	R			Engr. 407	3
*Electives	3			Electives	3
	<hr/> 18		<hr/> 18		<hr/> 18

The Senior electives shall be chosen from the following list: E.E. 355—Electrical Applications in Buildings; Ec. 374—Accounting; Military 401, 402, 403; C.E. 404—Engineering in City Planning; L.A. 402—Institutional Planning; L.A. 403—Recreational and Regional Planning; T.&A.M. 514, 515, 516—Advanced Mechanics of Materials; T.&A.M. 498—Construction Materials; A.E. 375—Farm Structures; Geol. 374—Engineering Geology.

## Description of Courses

100. Technical Lectures. Elementary principles of Architectural Engineering. Spring. Lect. 1. Required.

110. Architectural Drawing. Preparatory course in architectural design. Perspective shades and shadows and wash rendering of simple architectural forms. Application of principles in the design of small unit structures. Prerequisite: Engr. Dr. 132. Fall, Spring. Lab. 4, 3 hr. Credit 4.

114. Freehand Drawing. Elementary drawing of form in relation to space. Casts and solids are drawn in pencil and charcoal. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

115. Freehand Drawing. Form construction in charcoal of heads and architectural ornament. Prerequisite: 114. Fall, Winter, Spring. Lab. 1 to 3 hr. Credit 1 to 3.

221. Freehand Drawing. Construction of movement, volume and space in drawing cast figures in charcoal; embodying problems suited to individual needs. Prerequisite: 115. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

222. Freehand Drawing. Advanced drawing and composition. Creating pictorial, decorative and architectural form. Casts, models, still life, etc., in charcoal or color. Prerequisite: 221. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

231, 232, 233. **Freehand Drawing.** Water color painting from landscape, models, and still life. Color theory and composition of color and form. Stressing individuality of creative work in various fields. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

234, 235, 236. **House Design.** Aesthetic principles of planning as applied to domestic architecture. Special consideration given to economic use of materials, methods of construction, and mechanical equipment. Fall, Winter, Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3 each course.

271. **Elements and Composition.** Problems in the orders and elementary composition and planning rendered in wash and water color.

A. (For Arch. Engr. students.) Prerequisite: 109. Fall, Winter. Lab. 2, 3 hr. Credit 2.

B. (For Landscape Architecture students.) Fall. Lab. 3, 3 hr. Credit 3.

272, 273. **Architectural Engineering Design.** Continuation of 271. Conventional rendering. Problems illustrating the principles of architecture as applied to engineering structures.

A. (For Architectural Engineering students.) Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

B. (For Landscape Architecture students.) Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

324. **Freehand Drawing.** Drawing and picture organization in pen and ink from landscape and architectural subjects. Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

325. **Freehand Drawing.** Pencil sketching. Individuality and originality in the study of technique and composition of creative work in sketching landscape, etc. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

326. **Freehand Drawing.** Mediums suited to student needs in different departments, including lithography, etching, wood engraving, linoleum block, etc. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

327. **Freehand Drawing.** Advanced painting and drawing from many subjects, embracing plastic qualities giving specific appreciation in creative, pictorial, decorative and architectural thinking. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

351, 352, 353. **History of Architecture.** Influence of past civilization. Evolution of architectural forms from the Egyptian period to modern times with their relation to and influence on allied arts. Readings, sketches, and reports. Fall, Winter, Spring, respectively. Lect. 2. Rec. 1. Credit 3 each course.

381. **Architectural Engineering Design.** Continuation of 273. Lab. 2 or 4, 3 hr. Credit 2 or 4.

A. (For Architectural Engineering students.) Fall. Credit 4.

B. (For Landscape Architecture students.) Winter. Credit 2.

382. **Architectural Engineering Design.** Continuation of 381. Prerequisite: 381. Winter, Spring. Lab. 4, 3 hr. Credit 4.

383. **Architectural Engineering Design.** Continuation of 382. Prerequisite: 382. Spring. Lab. 4, 3 hr. Credit 4.

384, 385, 386. **Principles of Architectural Design.** Elective for students other than those registered in the Curriculum in Arch. E. Problems in design dealing with simple architectural forms. Methods of presentation. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

400. **Senior Inspection Trip.** One week in Chicago or other suitable place. Prerequisite: Senior Arch. E. classification. Fall. Required.

491. **Commercial Building Design.** Planning of commercial structures with particular reference to industrial occupancy. Prerequisite: 383, C.E. 335. Fall. Lab. 4 to 7, 3 hr. Credit 4 to 7.

492. **Building Construction.** An extended study of scale and F. S. details of designs produced in 491. Prerequisite: 491. Winter. Lect. 1. Lab. 3 to 6, 3 hr. Credit 4 to 7.

493. **Special Building Design.** Advanced commercial and industrial structures treated from an aesthetic standpoint. Prerequisite: 492. Spring. Lect. 1. Lab. 3 to 6, 3 hr. Credit 4 to 7.

494. **Professional Relations, Specifications, and Estimating.** Relations of architect, owner, and builder. Office organizations; building ordinances; professional ethics. Methods of estimating. Prerequisite: classification in 491. Spring. Lecture 3. Credit 3.

495. **Seminar.** Preparation and extempore delivery of reports on building construction or other assigned topics. Prerequisite: senior classification. Spring. Required without credit.

600. **Advanced Design.** Design for graduate students in Architectural Engineering. Fall, Winter, Spring. Mr. Kimball.

604. **Research.** Mr. Kimball.

## BACTERIOLOGY

R. E. BUCHANAN, Head of Department

MAX LEVINE, Professor in Charge

Profesors Brown, Hammer, Werkman; Associate Professor Merchant; Assistant Professor McCleskey; Instructor Swingle; Graduate Assistants Mitchell, Powers; Fellows Cole, Weber

*For information concerning the Division of Industrial Science, see page 131.*

The department is housed on the first and second floors and the basement of Science Hall.

The laboratories in veterinary bacteriology are equipped for both undergraduate and graduate courses in bacteriology in its relationship to the diseases of animals.

### Curriculum In Industrial Science—Major Bacteriology

This curriculum is designed to give fundamental training in general and technical bacteriology such as will fit students to be agricultural bacteriologists, soil bacteriologists, dairy bacteriologists, veterinary bacteriologists, sanitary experts, sanitary bacteriologists, and experts in bacteriology as related to the home and to the industries.

For freshman and sophomore years, see page 285.

For junior and senior years, see page 286.

### Description of Courses

224. **General and Pathogenic Bacteriology.** (Vet. Hyg. 224.) Morphology, classification, cultivation, and physiological characteristics of pathogenic bacteria; principles of infection and immunity. Fall. Rec. 4. Lab. 4, 3 hr. Credit 7.

225. **Pathogenic Bacteriology.** (Vet. Hyg. 225.) Detailed study of the bacteria associated with animal diseases. Continuation of Vet. Hyg. 224. Winter. Rec. 3. Lab. 3, 2 hr. Credit 5.

304. **General Bacteriology.** Morphology, classification, physiology, and cultivation of bacteria; relation of bacteria to health of man, animals and plants, the home, sanitation, and industry.

- A. For students in agronomy, animal husbandry, dairy industry, horticulture, technical journalism, and industrial science. Prerequisite: organic chemistry. Fall, Winter. Lect. and demonstrations 5. Lab. 2, 2 hr. Credit 5.
- B. For students in home economics. Prerequisite: organic chemistry. Fall, Winter, Spring. Lect. and demonstrations 5. Lab. 2, 2 hr. Credit 5.
- C. For students in forestry and chemical engineering. Prerequisite: organic chemistry. Spring. Lect. 3. Lab. 1, 3 hr. Credit 4.
- D. For students in engineering. Prerequisite: general chemistry. Winter. Lect. 2. Lab. 1, 3 hr. Credit 3.



350. Dairy Bacteriology. (D.I. 350.) Bacteria in milk and its derivatives; the production and handling of dairy products from the hygienic viewpoint. Prerequisite: Bact. 304A. Winter. Lect. 4. Lab. 3, 2 hr. Credit 4 to 6.

404. Special Problems. Credit 1 to 5.

405. Special Problems in Sanitary and Food Bacteriology. Prerequisite: 304A and 534 or equivalent. Fall, Winter, Spring. Credit 3 to 8.

450. Special Dairy Bacteriology. (D.I. 450.) Laboratory investigations, assigned readings and reports on bacteriological problems relating to dairying. Prerequisite: 350. Fall, Winter, Spring. Credit 2 to 6.

534, 535. Sanitary and Food Bacteriology. (534) Micro-organisms in water supplies. Prerequisite: 304D or equivalent. Fall, Spring. Lect. 2. Lab. 1, 3 hr. Credit 3. (535) Bacteria, yeasts and molds in food products and the industries. Prerequisite: 534 or equivalent. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4. Mr. Levine.

536. Laboratory Methods and Diagnosis. Prerequisite: 304A or equivalent. Spring. Lect. 2. Lab. 6 or 9 hr. Credit 4 or 5. Mr. McCleskey.

537. Municipal and Rural Sanitation. Principles of water supply, sewage and garbage disposal, disinfection, air conditions, control of contagious diseases. Prerequisite: 304D or equivalent. Spring. Lect. 3. Credit 3. Mr. Levine.

554. Bacteriology of Milk. (D.I. 554.) The various problems in connection with the handling and supervision of milk supplies. Prerequisite: 350. Spring. Lect. 2. Credit 2. Mr. Olson.

555. Laboratory work accompanying 554. (D.I. 555.) Spring. Lab. 3, 2 hr. Credit 2. Mr. Olson.

556. Bacteriology of Butter and Cheese. (D.I. 556.) The desirable and undesirable bacteriological changes occurring in cream intended for butter making and in butter and cheese. Prerequisite: 350. Fall. Lect. 2. Credit 2. Mr. Hammer, Mr. Olson.

557. Laboratory work accompanying 556. (D.I. 557.) Fall. Lab. 3, 2 hr. Credit 2. Mr. Olson.

560. Systematic Bacteriology. History of bacterial classification, the International Rules of Nomenclature as applied to bacteria; development of a classification of bacteria based upon relationships. Prerequisite: 304A or equivalent. Fall. Lect. 3. Credit 3. Mr. Buchanan.

561, 562, 563. Seminar. Required of all students taking major work in bacteriology. Fall, Winter, Spring, respectively. Credit 1 each quarter. Mr. Buchanan, Mr. Levine.

564. Soil Bacteriology. (Soils 564.) Occurrence and activities of soil bacteria and their influence on soil fertility. Prerequisite: Bact. 304A, and credit or classification in Soils 354. Winter. Rec. 3. Lab. 3, 2 hr. Credit 5. Mr. Brown.

571, 572, 573. Seminar in Fermentations. Fall, Winter, Spring, respectively. Credit 1 each quarter. Mr. Werkman.

574. Special Poultry Bacteriology. Bacterial diseases in poultry, relationships of bacteria to storage of poultry and poultry products. Prerequisite: General Bacteriology. Spring. Rec. 2. Lab. 2, 2 hr. Credit 3. Mr. Werkman, Mr. McCleskey.

575. Immunity and Serum Therapy. Theories of immunity and immunization; preparation of vaccines and antisera. Prerequisite: 304A. Winter. Lect. 3. Lab. 1, 3 hr. Credit 4. Mr. Werkman.

631, 632, 633. Physiology of Bacteria. Characteristics of bacterial environments, influence of physical and chemical environment on changes produced by micro-organisms; enzymes; fermentations. Winter, Spring, Fall, respectively. Lect. 3. With or without lab. 3 to 9 hr. Credit 3 to 6. Mr. Buchanan, Mr. Werkman.

655. Conferences in Dairy Bacteriology. (D.I. 655.) Discussions of bacteriological problems relating to the various phases of dairying. Spring. Lect. 2. Credit 2. Mr. Hammer.

656. Identification of the Organisms Common in Dairy Products. (D.I. 656.) Identification and relationships of the desirable and undesirable organisms commonly encountered in dairy products. Fall. Lect. 2. Lab. 3, 2 hr. Credit 4. Mr. Hammer, Mr. Olson.

674. Advanced Soil Bacteriology. (Soils 674.) The occurrence and activities of bacteria, molds, protozoa, and algae in soils and their functions. Spring. Rec. 3. Rec. and lab. 2, 2 hr. Credit 5. Mr. Brown.

**690. Research.**

A. Soil Bacteriology. (Soils 690A.) Mr. Brown.

B. Pathogenic Bacteriology. (Vet. Hyg. 690B.) Mr. Murray.

C. Dairy Bacteriology. (D.I. 690C.) Prerequisite 350. Messrs. Hammer, Baker, Olson.

D. General or Systematic Bacteriology. Messrs. Buchanan, Levine, Werkman, McCleskey.

E. Pathogenic Bacteriology. Prerequisite: 224 or equivalent. Mr. Merchant, Mr. Werkman.

F. Sanitary and Food Bacteriology. Prerequisite: 304, 534, or equivalent. Mr. Levine, McCleskey.

G. Physiology of Bacteria and Fermentations. Mr. Buchanan, Mr. Werkman.

H. Household Bacteriology. Prerequisite: 304B or equivalent. Mr. Levine.

695A. Conferences in Soil Bacteriology. (Soils 695A.) Reports and discussions on current investigations. Fall, Winter, Spring. Credit 1 each quarter. Mr. Brown.

## BOTANY

I. E. MELHUS, Head of Department

Professors Bakke, Dietz, Gilman, Martin; Associate Professors Aikman, Loomis, Porter; Assistant Professors Goodman, Hayden, Sass; Instructor Standen; Fellows Cooper, Gould, Shubert, Warner; Extension Workers Layton, Porter, Sylwester

*For information concerning the Division of Industrial Science, see page 131.*

The Botany department offers instruction in all lines of scientific endeavor pertaining to plant life. A foundation for work in horticulture, farm crops, forestry, landscape architecture, home economics, and genetics is thus provided. It prepares men and women for teaching the various phases of botany and for doing research in the plant sciences. Many of the students majoring in the department find employment as teachers in high schools and colleges and as investigators in the United States Department of Agriculture, State Experiment Stations, and commercially and privately endowed research institutions.

The department is housed in the Botany Building. It is equipped with laboratories for both undergraduate and graduate work in all the different phases of the botanical sciences.

Equipment is available for research including a herbarium of 180,000 specimens containing many rare collections among the flowering plants and fungi. In addition, the college and agricultural experiment station grounds, consisting of 1990 acres, offer a wide range of living plant material growing in its native condition in the college woods, planted for ornamental purposes on the campus, and for experimental purposes on the experiment station plots.

### Curriculum In Industrial Science—Major Botany

For freshman and sophomore years, see page 285.

For junior and senior years, see page 286.

## Description of Courses

101, 102, 103. **General Botany.** (101) Growth response of seed plants. How seed plants make food, grow, differentiate, and reproduce. Fall, Winter, Spring. Group conferences 3, 2 hr. (102) The lower plants as to their structure, function, and sequence in development. Winter, Spring. Group conferences 3, 2 hr. (103) Plants in the field, their ways of living, relationship, and identification. Spring. Group conferences 2, 3 hr. Credit 3 each course.

205. **Elementary Plant Physiology.** Principles of absorption, conduction, transpiration, photosynthesis, respiration, growth, movement, and reproduction. Prerequisite: 101. Fall, Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

206. **Systematic Botany.** Spring and summer flora. Historical survey of various systems of classification; principal groups by means of representatives. Prerequisite: 101. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

207. **General Plant Pathology.** Nature, cause, and control of diseases of field, orchard, and forest crops. Prerequisite: 205 except for Farm Management students. Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

254. **Native Trees and Shrubs.** Identification in field and laboratory. Prerequisite: 101. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

255. **Nature Study.** Materials, methods, aesthetic and economic aspects of plant life; for public school teaching. Plants in legend and folk-lore and their use by Indians and pioneers. Prerequisite: 101. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

256, 257. **Dendrology.** Families, genera and species of North American trees. (256) Angiosperms. Prerequisite: 206. Fall. Rec. 2. Lab. 2, 2 hr. and 2 hrs. in field. Credit 4. (257) Gymnosperms. Prerequisite: 206. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

344. **Seed Analysis.** (F. C. 344.) Principles and practices of purity analyses; identification, classification, and characteristics of seeds in different families. Prerequisite: 102. Fall. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

354. **Weed Identification and Control.** Economic importance and identification of weeds; principles and methods of control. Prerequisite: 205. Fall. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

404. **Embryogeny.** Cell structures, cell division, and the structural and functional relationships of the four divisions of the plant kingdom. Prerequisite: 101. Fall. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

405. **General Histology.** Origin and cellular structure of the tissues of the vegetative organs of seed plants. Prerequisite: 205. Winter. Rec. 1. Lab. and confer. 2, 3 hr. Credit 4.

406. **Plant Cytology.** Structure of the cell. Cytoplasm and its inclusions. The nucleus and its relation to genetic problems. Prerequisite: 404. Fall. Rec. 1. Rec. and lab. 2, 2 hr. Credit 3.

414, 415. **Applied Mycology.** The fungi in relation to industry and agriculture. Prerequisite: Bact. 304. Fall, Spring, respectively. Rec. 2. Lab. 1, 3 hr. Credit 3 each course.

416. **Forest Pathology.** The life histories, influence of environmental conditions, pathogenicity, and control measures of forest disease pathogens, and micro-organisms attacking lumber. Winter. Prerequisite: 205. Rec. 2. Lab. 2, 3 hr. Credit 4.

424. **General Plant Ecology.** Native and crop vegetation in relation to factors of the environment, application to forestry, grazing, and general plant production. Prerequisite: credit or classification in 205. Fall. Rec. 2. Lab. 1 or 2, 3 hr. Credit 3 or 4.

445. **Seed Viability.** (F. C. 445.) Principles and practices of seed germination. Factors affecting viability; physiology of germination. Prerequisite: 205. Winter. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

455. **Botany of Weeds and Poisonous Plants.** Classification and biology of weeds; toxicology of plants; medicinal plants. Prerequisite: 206. Winter. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

456. **Poisonous Plants.** Classification, distribution, identification, and control of poisonous plants; toxicology of plants. Prerequisite: 101 or 102. Spring. Group conferences 3, 2 hr. Credit 3.

474. **Special Problems.** Prerequisite: 15 credits in Botany. Fall, Winter, Spring. Credit 2 to 5.

- A. Morphology.
- B. Physiology.
- C. Plant Pathology.
- D. Mycology.
- E. Systematic Botany.
- F. Plant Ecology.
- G. Economic Botany.

494. **Methods in Teaching Botany.** (Voc. Ed. 494.) Prerequisite: 15 credits of botany. Spring. Rec. 3. Credit 3.

505. **Methods of Cytology.** The paraffin method as applied to cytological material. The smear method, temporary and permanent. Living cells. Prerequisite: 406. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3. Mr. Sass.

546. **Seed Borne Diseases.** (F. C. 546.) Detection, identification, and control of parasitic organisms carried by crop seeds. Prerequisite: 207. Spring. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3. Mr. Porter.

554. **Morphology of Crop Plants.** Structure and structural development of the more important crop plants as related to their cultivation. Prerequisite: 205. Spring. Group conference 2, 3 hr. Credit 3. Mr. Martin.

555. **Methods in Histology.** Methods of killing, imbedding, sectioning, and staining plant material. Prerequisite: 205. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3. Mr. Sass.

556, 557. **Advanced Histology.** (556) Origin, development, and structure of reproductive organs, seeds, and fruit of seed plants. Prerequisite: 405, 555. (557) Comparative histology of the wood of vascular cryptogams and seed plants. Prerequisite: 405. Spring. Group conference 2, 3 hr. Credit 3. Mr. Sass.

559. **Advanced Morphology.** One or more groups of the plant kingdom. Prerequisite: 406, 555. Fall, Winter, Spring. Rec. and lab. Credit 2 to 5 each quarter. Mr. Martin.

564. **Physiology of Seeds and Special Topics.** Factors involved in the storage and germination of seeds. Prerequisite: 205. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Bakke.

565. **Advanced Field Botany.** Plant life in the field, biologic and humanistic aspects. Selection of materials and methods of field presentation. Prerequisite: 205. Summer. Confer. 2, 1 hr. 12 hours field work. Credit 3. Mr. Dietz.

566. **Native Range Plants.** Geographic distribution, identification and use of native field and forest forage plants. Fall. Prerequisite: 424. Rec. 1. Lab. 2, 3 hr. Credit 3. Mr. Dietz.

571, 572, 573. **Advanced Plant Pathology.** Diseases of special crops. Virus, bacterial, and fungus diseases of field and horticultural crops. Prerequisite: 207. Fall, Winter, Spring, respectively. Rec. 2. Lab. 1, 3 hr. Credit 3 each course. Mr. Melhus, Mr. Porter.

574. **Plant Pathology.** Specific problems in the diseases of plants. Prerequisite: 207. Fall, Winter, Spring. Mr. Melhus, Mr. Gilman.

575. **Field Mycology.** Collection and taxonomy of fungi, and relation of their occurrence to environmental factors. Preparation and utilization of mycological exsiccati. Prerequisite: 207. Rec. 2. Lab. 4, 3 hr. Credit 3. Summer. Mr. Gilman.

576. **Field Plant Pathology.** Technique and interpretation of field plots, methods of preparation and application of fungicides; surveys and estimates of crop losses. Prerequisite: 207. Rec. 4. Lab. 4, 3 hr. Credit 4. Summer. Mr. Melhus.

584. **Advanced Plant Ecology.** Origin, development and reactions of vegetation, classification of vegetation units, plant indicators. Prerequisite: 424. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3. Mr. Aikman.

585. **Experimental Field Ecology.** Quantitative investigation of environment; methods and instruments used. Problems. Prerequisite: 424. Fall, Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3. Mr. Aikman.

594. **Advanced Systematic Botany.** Special groups: (1) Algae, (2) mosses, (3) ferns, (4) seed plants. Prerequisite: 206. Fall, Winter, Spring. Rec. 1 or 2. Lab. 2 or 3, 3 hr. Credit 3 to 5. Miss Hayden, Mr. Goodman.

595. **Agrostology.** Systematic position and economic uses of important grasses. Prerequisite: 205. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3. Mr. Dietz, Miss Hayden.

596, 597. **Advanced Economic Botany.** Phylogeny, taxonomy, geography and agricultural uses of plants. Prerequisite: 205. Fall, Spring, respectively. Rec. 2. Lab. 2, 3 hr. Credit 4 each course. Mr. Dietz, Mr. Porter.

598. **Seminars.** Meetings of the botanical staff and students to discuss recent literature, problems being investigated and other topics of botanical interest. Messrs. Martin, Bakke, Melhus, Miss Hayden.

A. For the staff and all students in botany. Fall, Winter, Spring.

B. For all students taking major work in plant pathology. Fall, Winter, Spring. Credit 1.

C. For all students taking major work in physiology and ecology. Fall, Winter, Spring. Credit 1.

D. For all students taking major work in morphology and taxonomy. Fall, Winter, Spring. Credit 1.

599. History of Botany. Prerequisite: 205. Spring. Lect. 3. Credit 3. Mr. Martin.

606. Morphology of the Algae. Structure, reproduction, and systematic position of the algae. Prerequisite: 205. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3. Miss Hayden.

611, 612. Plant Physiology. The water relations of plants, mineral and organic nutrition, and physiology of growth. Prerequisite: 205, Chem. 256. Fall, Winter, respectively. Rec. 3. Lab. 1 or 2, 3 hr. Credit 4 or 5 each course. Mr. Loomis.

613. Advanced Plant Physiology. Growth correlations, tropisms and physiology of reproduction. Prerequisite: 612. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Loomis.

617. Physiological Methods and Technique. Winter. Rec. 1. Lab. 2 to 4, 3 hr. Credit 3 to 5. Mr. Bakke, Mr. Loomis.

618. Plant Enzymes. Role of enzymes in plants, their secretion, preparation, isolation, and specific action. Summer. Conference 2. Credit 1. Mr. Loomis.

634. Bacterial and Virus Diseases of Plants. Symptoms, environmental influences, host reactions, laboratory and greenhouse cultural studies. Prerequisite: 207. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Melhus.

635. Disease Control. Exclusion, eradication, protection, and methods of selection for disease resistance. Preparation of fungicides and theories of fungicidal action. Prerequisite: 573. Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3. Mr. Melhus, Mr. Dietz.

636. Plant Pathological Technique. Cultural, physiological and histological technique. Laboratory practice in isolation of parasites, germination, inoculation, and carrying stock cultures. Prerequisite: 207. Winter. Rec. 2. Lab. 3, 3 hr. Credit 5, Mr. Melhus, Mr. Gilman.

641, 642, 643. General Mycology. Taxonomy, morphology, and phylogeny of slime molds and fungi (phycomycetes, ascomycetes, fungi imperfecti, and basidiomycetes). Prerequisite: 207. Fall, Winter, Spring, respectively. Rec. 2. Lab. 2, 3 hr. Credit 4 each course. Mr. Gilman.

644. Advanced Mycology. Some specific group of the fungi as related to applied agriculture, pathology, bacteriology, soils, or dairying. Prerequisite: 643. Fall, Winter, Spring. Credit 3 to 5. Mr. Gilman.

654. Advanced Plant Ecology. Relation of environmental conditions to growth and competition in plants. Prerequisite: 584. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3. Mr. Aikman.

695. Research.

A. Morphology. Mr. Martin, Mr. Sass.

B. Physiology. Mr. Bakke, Mr. Loomis.

C. Plant Pathology. Messrs. Melhus, Dietz, Porter, Gilman, Reddy.

D. Mycology. Mr. Gilman.

E. Systematic Botany. Miss Hayden, Mr. Goodman.

F. Plant Ecology. Mr. Aikman, Miss Hayden.

G. Economic Botany. Mr. Dietz, Mr. Porter.

## CERAMIC ENGINEERING

PAUL E. Cox, Head of Department

Instructor Petersen

*For information concerning the Division of Engineering, see page 125.*

Ceramic engineering deals with the application of chemistry, physics, mathematics, and the mathematical sciences to the solution of the problems of manufacture of brick, tile, terra cotta, pottery, glass, enameled metal goods, cement, electrical insulators, spark plug porcelains, grinding wheels, fire resisting furnace parts, and countless other articles essential to civilization. Curricula in ceramic engineering are strictly American in origin and are so recent that the first graduate from such a curriculum is still actively engaged in the pursuit of his profession. Foreign countries have patterned schools after those of America.

Iowa State College is one of the pioneer institutions to offer a curriculum so that special work in the silicate industries could be enjoyed. The course of study gives adequate preparation in the sciences so that new problems can be met and solved, and sufficient contact with industrial processes so that a choice of the final field may be made wisely, according to the talents of the individual. The work appeals to any sort of temperament, there being demand for research workers, business executives, sales force men, analysts, glaze and body experts, kiln designers, and in fact, every sort of talent.

Students who desire to qualify as specialists in fine wares may do so by availing themselves of certain choices indicated in the outlined curriculum. These lead to the degree of Bachelor of Science in Ceramics. Such graduates do not qualify as engineers and cannot be so certified. It will be noted that less than two quarters of additional work will complete both types of ceramic education which is desirable for the ambitious and talented type of student.

### Curriculum In Ceramic Engineering

Leading to the degree of Bachelor of Science.

For graduate work, see page 151.

For entrance requirements, see page 99.

#### FRESHMAN YEAR

Fall Quarter	Credit <sup>1</sup>	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		Plane Analytic Geometry	
Math. 101	5	Math. 102C	4	Math. 103	5
Drawing and Projection		Theory of Project. Drawing		Working Drawings	
Engr.Dr. 131	2	Engr.Dr. 132	3	Engr.Dr. 133	3
Engineering Problems		Engineering Problems			
Gen.E. 104	1	Gen.E. 105	1		
Military 121	1	Military 122	1	Military 123	1
	<u>16</u>		<u>16</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter).

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

#### SOPHOMORE YEAR

Quantitative Analysis		Quantitative Analysis		Quantitative Analysis	
Chem. 211	4	Chem. 212	4	Chem. 213	4
Fabrication, Cer. Wares		Fabrication, Cer. Wares		Engineering Problems	
Cer.E. 204	1	Cer.E. 205	2	Gen.E. 206	1
Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Mechanics and Heat		Elect. and Magnetism		Sound and Light	
Phys. 221	5	Phys. 222	5	Phys. 223	5
Principles of Economics		Expository Writing		Statics of Engineering	
Ec. 261	3	Engl. 204	2	T.&A.M. 274	3
Military 221	1	Military 222	1	Military 223	1
	<u>18</u>		<u>18</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Seminar, Cer.E. 201, 202, 203.

## JUNIOR YEAR

Ceramic Calculations Cer.E. 305	5	Structural Clay Prod. Cer.E. 304 or	5	Refractories Cer.E. 306	3
Geology Geol. 201 or	4	White Wares & Pot'ry Cer.E. 319	4	Geology Geol. 203 or	4
Physical Chemistry Chem. 321		Geology Geol. 202 or		Physical Chemistry Chem. 323	
Mechanics of Materials T.&A.M. 324 or	5	Physical Chemistry Chem. 322	4	Extempore Speaking P.S. 311	2
†Freehand Drawing Arch.E. 114 and 115	4	Dynamics of Engr. T.&A.M. 344 or	4	El. of Structures C.E. 335 or	5
*Electives		†Freehand Drawing Arch.E. 221 and 222		†Block Molds Cer.E. 314	
		Electives	5	Electives	4
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Cer.E. 301, 302, 303.

\*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in electives of the Junior or Senior year.

†Students who major in white wares, pottery, terra cotta, and art wares will take these subjects.

## SENIOR YEAR

Enamels Cer.E. 405	3	Glass Technology Cer.E. 406	3	Pyrometry Cer.E. 416	3
Concrete Structures C.E. 437 or	5	Engineering Valuation Engr. 407	3	Engineering Contracts Engr. 405	3
†Decalcomania Cer.E. 417		Mineralogy Geol. 355	4	Special Problems Cer.E. 426	5
D. C. Machines E.E. 338	3	A. C. Circuits & Machines E.E. 339	3	A. C. Machines E.E. 340	3
Electrical Lab. E.E. 348	1	Electrical Lab. E.E. 349	1	Electrical Lab. E.E. 350	1
American Government Govt. 315	3				
Electives	3	Electives	4	Electives	3
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Cer.E. 401, 402, 403.

†Students who major in white wares, pottery, terra cotta, and art wares will take these subjects.

## Description of Courses

201, 202, 203. Seminar. A weekly meeting for the transaction of campus and off-campus student business. Fall, Winter, Spring, respectively. Required each course.

204. Fabrication of Ceramic Wares. Potter's wheel; plaster of Paris molds; jigging, pressing and casting wares; glaze dipping; placing and firing small wares. Fall. Lab. 1, 3 hr. Credit 2.

205. Fabrication of Ceramic Wares. Plaster mold making. Winter. Lab. 2, 3 hr. Credit 2.

301, 302, 303. Seminar. Weekly meeting. Fall, Winter, Spring, respectively. Required each course.

304. Structural Clay Products. Raw materials and their tests. Finished products and their tests. Factory layouts, machines and equipment. Winter. Rec. 5. Credit 5.

305. Ceramic Calculations. Compounding bodies, glazes, glass and enamels. Prerequisite: Chem. 103. Fall. Rec. 3. Lab. 2, 3 hr. Credit 5.

306. Refractories. Nature and source of raw materials. Tests for raw materials and finished products. Consumers' requirements for finished products. Prerequisite: 305. Spring. Rec. 3. Credit 3.

314. **Block Molds.** Design of dinner service and other pottery shapes, production of block mold; embossing. Prerequisite: 204, 214. Fall. Lab. 5, 3 hr. Credit 5.

319. **White Wares and Pottery.** Raw materials and their tests. Finished products and their tests. Factory layouts, machines and equipment. Winter. Rec. 5. Credit 5.

324. **Hand Made Pottery.** Avocational pottery making, coiling and modeling of forms and design and execution of simple decorations. Dipping of glazes. Simple mold making. For public school teachers, occupational therapy workers, and persons who crave to do creative work. Freehand drawing is a desirable antecedent but is not required. Fall, Winter, Spring. Lab. 1 to 5, 3 hr. Credit 1 to 5.

401, 402, 403. **Seminar.** Fall, Winter, Spring, respectively. Weekly meeting to transact student business. Required each course.

405. **Enamels.** Sheet steel, cast iron and jewelry enamels. Their compositions, specifications and applications. Plant layouts. Raw materials and finished products, tests and specifications. Fall. Rec. 3. Credit 3.

406. **Glass Technology.** Industrial and artistic glass. The compositions, raw materials and specifications, finished products, specifications, plant layouts, machinery and equipment, and control methods for production. Winter. Rec. 3. Credit 3.

416. **Pyrometry.** Theory and practice of high temperature measuring devices, including electrical, optical, and pyro-chemical types. Prerequisite: Math. 212, Phys. 223. Spring. Rec. 3. Credit 3.

417. **Decalcomania.** Production of ceramic decalcomania carried through all the processes and applied to the finished wares. Fall. Lab. 5, 3 hr. Credit 5.

426. **Special Problems.** A problem is selected in conference with the instructor, carried through to completion under direction and finally written up in a form suitable for publication. Prerequisite: Chem. 323, and senior classification in Cer. Engr. Spring. Credit 5.

427. **Physical Chemistry.** (Chem. 427.) Applied to processes in ceramic manufacture. Prerequisite: Chem. 323. Spring. Rec. 4. Credit 4.

601, 602, 603. **Ceramic Technology.** Research problems with ceramic materials. Fall, Winter, Spring, respectively. Rec. and lab. 5. Credit 5 each course. Mr. Cox.

608. **Research.** Mr. Cox.

## CHEMICAL AND MINING ENGINEERING

O. R. SWEENEY, Head of Department

Associate Professor Webber; Assistant Professor McMillen; Instructors Benson, Bridger; Graduate Assistant Measamer

*For information concerning the Division of Engineering, see page 125.*

The Department of Chemical and Mining Engineering was established to supply men for those industries which require engineers with a thorough knowledge of chemistry. The department gives degrees in chemical and in mining engineering.

Besides the work given in the department, the student studies theoretical and applied chemistry, physics, mechanical drawing, mathematics, theoretical and applied mechanics, electrical engineering, and English.

At no period in the world's history has there been such a consistent demand for chemically trained engineers. Because of the unprecedented demand for the production of every sort of material in the cheapest possible manner, it is only natural that the winning of the primary materials from the earth should demand a large number of trained engineers.



Likewise, since these raw materials are being elaborated into such a large variety of materials by means of chemical processes, there is a large and constantly increasing demand for men trained in the fundamental operations of chemical engineering.

To list only a few of the demands for these men, there is cited the manufacture of heavy chemicals, dyes, sugar and foods in general, soap, electro-chemical products, paints, varnishes, lacquers, gas, tar, coke, and coal tar products. In the mining field such materials as coal, clay, gypsum, and metal ores demand their quota of trained engineers.

Two units of a building devoted exclusively to the departmental work have been completed. The departmental equipment consists of crushers, grinders, tube and pebble mills, jigs, classifiers, ore dressing machines, thickeners, Wilfley tables, vanners, hydraulic presses, extractors, filter presses, furnaces, centrifugal machinery, and water softeners; a large assortment of vacuum, atmospheric and pressure machinery, such as digestors, evaporators, distillation equipment, driers, and reaction vessels; also an electro-chemical laboratory supplied with direct and alternating current, with a very complete assortment of electro-chemical machinery; and control laboratories, fitted with the necessary testing and control apparatus.

### Curriculum In Chemical and Mining Engineering

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

FRESHMAN YEAR					
Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		Plane Analytic Geometry	
Math. 101	5	Math. 102C	4	Math. 103	5
Drawing and Projection		Theory of Proj. Drawing		Working Drawings	
Engr.Dr. 131	2	Engr.Dr. 132	3	Engr.Dr. 133	3
Engineering Problems		Engineering Problems		Pipe Fitting	
Gen.E. 104	1	Gen.E. 105	1	M.E. 231	1
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	16		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., Chem.E. 100 (Spring).

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

SOPHOMORE YEAR					
Quantitative Analysis		Quantitative Analysis		Quantitative Analysis	
Chem. 211	4	Chem. 212	4	Chem. 213	3
Inorganic Chemistry		Inorganic Chemistry		El. of Chemical Engr.	
Chem. 201	2	Chem. 202	2	Chem. E. 216	2
Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Expository Writing		Extempore Speaking		Engineering Problems	
Engl. 204	2	P.S. 311	2	Gen.E. 206	1
Mechanics and Heat		Elect. and Magnetism		Light and Sound	
Phys. 221	5	Phys. 222	5	Phys. 223	5
Military 201 or 221	1	Military 202 or 222	1	Machine Work	
				M.E. 232	2
				Military 203 or 223	1
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

Summer Plant or Mine Practice, 170 hours.

## JUNIOR YEAR\*

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Physical Chemistry		Physical Chemistry		Physical Chemistry	
Chem. 321	4	Chem. 322	4	Chem. 323	4
Organic Chemistry		Organic Chemistry		Organic Chemistry	
Chem. 331	5	Chem. 332	5	Chem. 333	5
Statics of Engineering		Mechanics of Materials		Dynamics of Engineering	
T.&A.M. 274	3	T.&A.M. 324	5	T.&A.M. 344	4
†Principles		†Principles		†Principles	
Chem.E. 351	2	Chem.E. 352	3	Chem.E. 353	3
Chemical Tech.		Power Measurement Lab.		Materials Laboratory	
Chem. 314	4	M.E. 354	1	T.&A.M. 327	2
	<hr/> 18		<hr/> 18		<hr/> 18

\*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

†For students appointed to the Reserve Officers' Training Corps (see [page 301]), these courses may be omitted in the Junior year; substitution will be allowed in such manner that the courses may be taken in the Senior year.

## SENIOR YEAR†

Industrial Chemistry		Industrial Chemistry		Industrial Chemistry	
Chem.E. 411	3	Chem.E. 412	3	Chem.E. 413	3
Chemical Engr. Lab.		Chemical Engr. Lab.		Chemical Engr. Lab.	
Chem.E. 421	3	Chem.E. 422	3	Chem.E. 423	3
Engineering Contracts		A.C. Machines		Engineering Valuation	
Engr. 405	3	E.E. 437	3	Engr. 407	3
D.C. Machines		Electrical Laboratory		Chemical Engr. Design	
E.E. 435	3	E.E. 438	1	Chem.E. 473	2
Electrical Laboratory		Chemical Engr. Design		Special Problems	
E.E. 436	1	Chem.E. 472	2	Chem.E. 466	2
Chemical Engr. Design		Special Problems			
Chem.E. 471	2	Chem.E. 465	3		
†American Government		Electives	3	Electives	4
Govt. 315	3		<hr/> 18		<hr/> 17
	<hr/> 18				

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Chem.E. 401, 402, 403; and Senior Inspection Trip, Chem.E. 400.

†May be omitted by students appointed to the Reserve Officers' Training Corps, see page 301.

## MINING ENGINEERING

For Freshman and Sophomore years, see page 201.

## JUNIOR YEAR

Principles		Principles		Principles	
Mn.E. 351	2	Mn.E. 352	3	Mn.E. 353	3
General Geology		General Geology		General Geology	
Geol. 201	4	Geol. 202	4	Geol. 203	4
Surveying		Mineralogy		Mine Surveying	
C.E. 325	3	Geol. 355	4	C.E. 330	3
Statics of Engineering		Mechanics of Materials		Dynamics of Engr.	
T.&A.M. 274	3	T.&A.M. 324	5	T.&A.M. 344	4
Chemical Technology		Engineering Contracts		Materials Laboratory	
Chem. 314	4	Engr. 405	3	T.&A.M. 327	2
*Electives	2		<hr/> 19	Electives	2
	<hr/> 18				<hr/> 18

\*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

## SENIOR YEAR

D.C. Machines		A.C. Machines		Mining Engr. Design	
E.E. 485	3	E.E. 487	3	Mn.E. 473	2
Electrical Laboratory		Electrical Laboratory		Mn. Engr. Laboratory	
E.E. 496	1	E.E. 488	1	Mn.E. 423	3
Mining Engr. Design		Mining Engr. Design		Mining Enterprises	
Mn.E. 471	2	Mn.E. 472	2	Mn.E. 416	2
Mn. Engr. Laboratory		Mn. Engr. Laboratory		Engineering Valuation	
Mn.E. 421	3	Mn.E. 422	3	Engr. 407	3
Economic Geology		Economic Geology		American Government	
Geol. 434	4	Geol. 455	4	Govt. 315	3
Structural Geology		Treatment of Ores			
Geol. 354	4	Mn.E. 415	2		
		Assaying			
		Mn.E. 417	2		
		Special Problems	} 2		
		Mn.E. 465 or			
		Electives		Electives	8
	17		19		16

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Mn.E. 401, 402, 403; Senior Inspection Trip, Chem.E. 400.

Suggested Electives: Bacteriology; Ceramics; Chemistry; Chemical Engineering 466, 586; Civil Engineering; Economics; English; General Engineering; Geology; Hydraulics; Mechanics; Mechanical Engineering; Mineralogy; Modern Languages.

## Description of Courses

## CHEMICAL ENGINEERING GROUP

100. Technical Lecture. The fields of chemical and mining engineering; the relation of the chemical engineer to industry. Spring. Lect. 1. Required.

161, 162, 163. Chemical Engineering Laboratorian. An approved assignment as laboratorian on special problems. Open only to students permanently excused from military training. Fall, Winter, Spring, respectively. Lab. 1, 3 hr. Credit 1 each course.

216. Elements of Chemical Engineering. Introduction to chemical engineering. Typical processes; fundamental operations. Problems. Spring. Lect. 2. Credit 2.

351, 352, 353. Principles of Chemical Engineering. (351) Industrial stoichiometry; fluid flow; heat transfer. Prerequisite: 216. Fall. Lect. 2. Credit 2. (352, 353) Raw materials; fundamental operations. Prerequisite: 351. Winter, Spring, respectively. Lect. 3. Credit 3 each course.

400. Senior Inspection Trip. One week in Chicago or other suitable place. Prerequisite: Senior Chem. E. classification. Fall. Required.

401, 402, 403. Technical Seminar. Technical reports. Fall, Winter, Spring, respectively. Lect. 1. Required each course.

411, 412, 413. Industrial Chemistry. Chemical engineering and chemical engineering machinery. Discussion of chemical processes, raw materials and their elaboration. Industrial chemical and electro-chemical operations. Prerequisite: 353. Fall, Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course.

421, 422, 423. Chemical Engineering Laboratory. Elaboration of raw materials and the use of chemical machinery. Calculation of costs and efficiencies. Control of operations. Physical and physico-chemical methods of plant control. To parallel 411, 412, 413. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

441, 442, 443. Elements of Chemical Engineering. For chemical technology, industrial science, and graduate students. Industrial stoichiometry, raw materials, fundamental chemical engineering operations, chemical engineering equipment, and chemical industrial processes. Prerequisite: Chem. 333. Fall, Winter, Spring, respectively. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3 each course.

465. Special Problems. On an approved topic to be selected before the end of the fall quarter of the senior year. Fall, Winter, Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3.

466. Special Problems. Continuation of 465. Fall, Winter, Spring. Lab. 2 to 9, 3 hr. Credit 2 to 9.

471, 472, 473. **Chemical Engineering Design.** Design and layout of chemical plants and chemical machinery. Prerequisite: 353. Fall, Winter, Spring, respectively. Lab. 2, 3 hr. Credit 2 each course.

586. **Advanced Applied Electro-Chemistry.** Electro-chemical industries. Prerequisite: 411. Spring. Lect. 3. Credit 3. Mr. Webber.

600. **Chemical Engineering Research.** Messrs. Sweeney, Webber, McMillen.

610. **Chemical Engineering Investigations.** Prerequisite: 413. Alternate years. Offered Fall, Winter, Spring, 1938-'39. Lect. and conf. 3. Credit 3. Messrs. Sweeney, Webber, McMillen.

614. **Advanced Industrial Chemistry.** Special advanced topical studies on chemical manufactories, such as foods, fertilizers, rayon, fixation of nitrogen, utilization of by-products, etc. Prerequisite: 413 or 443. Alternate years. Offered Fall, 1937. Lect. 3. Credit 3. Mr. Sweeney.

615. **Organization of Chemical Engineering Industries.** The development of the chemical engineering industry based upon the fundamental principles of plant location, design, unit operation costs, power utilization, management, and operation. Prerequisite: 353. Alternate years. Offered Spring, 1938. Lect. 3. Credit 3. Mr. Sweeney.

616. **Cellulose Industries.** The cellulosic raw materials, their chemistry, physics, economics and industrial uses. Prerequisite: 443 or 413. Alternate years. Offered Winter, 1938. Lect. 3. Credit 3. Mr. Webber.

620. **Advanced Technical Seminar.** Weekly conference. Discussion of current topics. Presentation of original papers. Prerequisite: graduate major in chemical engineering. Fall, Winter, Spring. One hour per week required without credit. Mr. Sweeney.

621, 622, 623. **Advanced Chemical Engineering Laboratory.** Advanced studies in unit operations. Prerequisite: 423. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course. Mr. Webber, Mr. McMillen.

651, 652, 653. **Advanced Chemical Engineering.** Selected advanced studies on chemical engineering unit operations. Prerequisite: 353. Alternate years. Offered Fall, Winter, Spring, 1938-'39. Lect. 3. Credit 3 each course. Messrs. Sweeney, Webber, McMillen.

671, 672, 673. **Advanced Chemical Engineering Design.** Design and layout of chemical plants and machinery. Planning industrial chemical laboratories. Prerequisite: 473. Fall, Winter, Spring, respectively. Lab. 1 to 3, 3 hr. Credit 1 to 3 each course. Mr. Sweeney.

### MINING ENGINEERING GROUP

351, 352, 353. **Principles of Mining Engineering.** (351) Selected studies on excavating, boring, shaft sinking, and mining. Prerequisite: Chem. 213. Fall. Lect. 2. Credit 2. (352, 353) Selected studies on mining apparatus, stoping, hoisting, ventilation, transportation, etc. Prerequisite: 351. Winter, Spring, respectively. Lect. 3. Credit 3 each course.

401, 402, 403. **Technical Seminar.** Technical reports. Fall, Winter, Spring, respectively. Lect. 1. Required each course.

415. **Treatment of Ores.** Ore dressing and amalgamation. Prerequisite: 351. Winter. Rec. 1. Lab. 1, 3 hr. Credit 2.

416. **Mining Enterprises.** Prospecting. Developing mineral deposits. Prerequisite: 415. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

417. **Assaying.** Fire assay methods for determination of gold, silver, and lead values in ores. Prerequisite: 351. Winter. Rec. 1. Lab. 1, 3 hr. Credit 2.

421, 422, 423. **Mining Engineering Laboratory.** Elaboration of raw materials and the use of mining machinery. Calculation of costs and efficiencies. Control of operations. Physical and physical chemical methods of mining plant control. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

424. **Mine Surveying.** Reviewing and advanced method. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

465, 466. **Special Problems.** On an approved mining engineering topic. Fall, Winter, Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3.

471, 472, 473. **Mining Engineering Design.** Mine plant design and selection of mine plant equipment. Fall, Winter, Spring, respectively. Lab. 2, 3 hr. Credit 2 each course.

561, 562, 563. **Metallurgy.** The winning of iron, steel, copper, gold, silver, lead, zinc, etc. Prerequisite: Chem. 333. Fall, Winter, Spring, respectively. Lect. 2. Lab. 1, 3 hr. Credit 3 each course. Mr. Sweeney.

600. **Mining Engineering Research.** Messrs. Sweeney, Webber, McMillen.

## CHEMISTRY

W. F. COOVER, Head of Department

Professors Brown, Buchanan, Fulmer, Gilman, Hixon, Nelson, Wilkinson; Associate Professors Clark, Edgar, Jennings, Naylor; Assistant Professors Bird, Johns, King; Instructors Brown, Castonguay, Greer, Hammer, Kempf, Lykken, Martin, Menzel, Moore, Sieling, Stanerson, Underkofler, Wilhelm; Graduate Assistants Ballard, Barr, Bindschadler, Buchanan, Carlson, Cohee, Dawson, Dunbar, Dundon, Eaton, Fietz, Fish, Franz, Glymph, Griffith, Hickey, Hunter, Kelley, Long, F. B. Moore, F. J. Moore, O'Hara, Ogg, Pacevitz, Rayman, Rieke, Ruby, Smith, Stewart, Sutton, Swislow, Whistler, Williams; Teaching Scholar Nicolaysen.

*For information concerning the Division of Industrial Science, see page 131.*

The department is organized to meet the demands for chemical training in a highly technical institution. Its work is therefore comprehensive and is grouped under the following heads: Inorganic chemistry and qualitative analysis, analytical, bio-physical, enzyme, food and sanitary, organic, physical, plant, physiological and nutritional, soil, and textile chemistry.

The equipment for carrying out the above lines of work is good. It is being increased as the developments in chemistry demand it.

The following curricula are offered:

- a. Chemical Technology.
- b. Industrial Science with major in Chemistry.
- c. Graduate courses leading to the M. S. and Ph. D. degrees.

### Chemical Technology

The field of chemical technology, which involves teaching, government, and research work, as well as industrial work, is becoming increasingly important as industry expands and is placed more completely under scientific control. It is a recognized fact that the economic utilization of our resources is a necessity. The trend in industrial development is toward diversification, quality, and economy in production. These are factors which are making obsolete many of the processes of industry and rendering imperative the employment of scientifically trained men.

This curriculum gives the basic training desired for positions as consulting chemists; as superintendents of factories of the industries based on chemistry or under chemical control, such as the manufacture of glass, pigments, paints and varnishes, oils and fats, soaps, sugar, glucose, explosives, dyes, gas, iron and steel alloys, petroleum products, paper, leather, fine chemicals, perfumes, drugs, foods; as chemists in government, state, municipal, experiment station, research or factory laboratories; or as teachers of chemistry.

### Curriculum In Chemical Technology

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

## FRESHMAN YEAR

For freshman year, see curriculum in Industrial Science, page 285. which is to be followed, except that Chem. 101C, 102C, and 103C shall be taken.

Students taking the curriculum in Chemical Technology should elect Zool. 104, 105, and Bot. 101 in their freshman year.

## SOPHOMORE YEAR

Fall Quarter	Credits <sup>2</sup>	Winter Quarter	Credits	Spring Quarter	Credits
Advanced Inorganic Chem. 201 <sup>1</sup>	2	Advanced Inorganic Chem. 202	2	Qualitative Analysis Chem. 203	3
Quantitative Analysis Chem. 211	4	Quantitative Analysis Chem. 212	4	Quantitative Analysis Chem. 213	3
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Sound and Light Phys. 223	5
Military 221	1	Military 222	1	Military 223	1
	<u>16</u>		<u>16</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## JUNIOR YEAR

Physical Chemistry Chem. 321	4	Physical Chemistry Chem. 322	4	Physical Chemistry Chem. 323	4
Organic Chemistry Chem. 331	5	Organic Chemistry Chem. 332	5	Organic Chemistry Chem. 333	5
Reasoning and Writing Engl. 205	3	Drawing and Projection Engr.Dr. 131	2	American Government Govt. 315	3
*German M.L. 441	3	*German M.L. 442	3	Working Drawings Engr.Dr. 133	2
	<u>15</u>	Extempore Speaking P.S. 311	3	*German M.L. 443	3
			<u>17</u>		<u>17</u>

## SENIOR YEAR

Micro-Chem. Analysis Chem. 518	3	Chemical Technology Chem. 411	3	Chemical Technology Chem. 412	3
**Chemistry, Electives	3	**Chemistry, Electives	3	**Chemistry, Electives	3
Elements of Chem. Engr. Chem.E. 441	3	Elements of Chem. Engr. Chem.E. 442	3	Elements of Chem. Engr. Chem.E. 443	3
Principles of Economics Ec. 261	3	Elementary Accounting Ec. 370	3	Engineering Contracts Engr. 405	3
***Electives	4	***Electives	4	***Electives	4
	<u>16</u>		<u>16</u>		<u>16</u>

For information concerning the Reserve Officers' Training Corps, see page 301.

\*Those desiring to elect a Biology, Geology, Physics, or other sequence approved by the Head of the Department and the Dean of the Division may take M.L. 441, 442, 443, as an elective in the Senior year.

\*\*Any fourth or fifth year sequence of courses in Chemistry approved as above.

\*\*\*Electives. It is urged that electives be chosen largely in courses other than Chemistry.

## Curriculum In Industrial Science—Major Chemistry

This curriculum is offered in order to co-operate with other departments of the institution in preparing students for responsible positions in industries which require fundamental training in other sciences along with intensive training in chemistry. These fields are important. Notable examples are found in the demand for bacteriological chemists in the canning, preserving and packing industries, and for chemists with special training in the baking, photographic, wholesale food, feed, and dairy industries, and for water survey and board of health work. This curriculum is also important for training teachers for science work in high schools and colleges.

For freshman and sophomore years, see the general curriculum in Industrial Science page 285.

For the junior and senior years the student must fulfill all the requirements as given on page 286.

## Graduate Curricula and Degrees

Graduate work in chemistry is also offered leading to the degrees of Master of Science and Doctor of Philosophy. A full description of courses will be found in the Graduate Bulletin.

## Description of Courses

Index to course numbers is given by the second and third figures:

(a) Inorganic Chemistry and Elementary Qualitative Analysis	01 to 09	(g) Household (including Textile) Chemistry	61 to 69
(b) Analytical Chemistry	11 to 19	(h) Physiological and Nutritional Chemistry	71 to 79
(c) Physical Chemistry	21 to 29	(i) Bio-physical (including Enzyme and Zymo-) Chemistry	81 to 89
(d) Organic Chemistry	31 to 39	(j) Research	91 to 99
(e) Food and Sanitary Chemistry	41 to 49		
(f) Agricultural (including Plant and Soil) Chemistry	51 to 59		

101. General Chemistry. Principles and the non-metallic elements.

- A. For students who have not had high school chemistry. Fall, Winter, Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.
- B. For students who have had high school chemistry. Fall. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.
- C. For students in Chem. Tech., Chem. Major, and those desiring a more extended study. Fall. Lect., demonstration, and rec. 2. Conference 1. Lab. 2, 3 hr. Credit 4.

102. General Chemistry. Metallic elements.

- A. For students who have not had high school chemistry. Prerequisite: 101. Fall, Winter, Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.
- B. For students who have had high school chemistry. Prerequisite: 101. Winter. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.
- C. For students in Chem. Tech., Chem. Major, and those desiring a more extended study. Prerequisite: 101. Winter. Lect., demonstration, and rec. 2. Conference 1. Lab. 2, 3 hr. Credit 4.

103. General Chemistry. General principles and analytical relationships including separation of common ions. Prerequisite: 102 or 106. Fall, Spring. Lect. and demonstration 1. Rec. and conference 2. Lab. 2, 3 hr. Credit 4.

- C. For students in Chem. Tech., Chem. Major, and those desiring a more extended study. Spring. Lect., demonstration, and rec. 2. Conference 1. Lab. 2, 3 hr. Credit 4.

105, 106. **General Chemistry.** For Home Economics students. Principles and the non-metallic elements. (105) Fall, Winter, Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4. (106) Metallic elements and their compounds. Fall, Winter, Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4. (A) For those who have not had high school chemistry. (B) For those who have had high school chemistry.

107. **Applied Chemistry.** For Agricultural Engineering and Civil Engineering students. The chemistry of materials with some work in qualitative analysis. Prerequisite: 102. Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.

174. **Applied Organic Chemistry.** For Veterinary students. Attention given to organic compounds of biological importance. Prerequisite: 103 or equivalent in general chemistry. Fall. Lect. 2. Rec. 1. Lab. 2, 3 hr. Credit 5.

175. **Physiological Chemistry.** For Veterinary students. Chemistry of the animal body; digestion; metabolism; nutrition. Prerequisite: 174. Winter. Lect. 2. Rec. 1. Lab. 2, 3 hr. Credit 5.

201, 202. **Inorganic Chemistry.** Principles and theories in detail. Prerequisite: 103. (201) Fall, Winter. (202) Winter, Spring. Lect. 2. Credit 2 each quarter.

203. **Qualitative Analysis.** Systematic analysis for ions except those of rare elements, with special attention to theory and the detection of negative ions. Prerequisite: 103. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

211, 212, 213. **Quantitative Analysis.** Theory and practice of elementary gravimetric and volumetric analysis. Prerequisite: 103. Fall, Winter. Rec. 2. Lab. 2 or 3, 3 hr. Credit 4 or 5. Spring. Rec. 1. Lab. 2 or 3, 3 hr. Credit 3 or 4.

251, 252. **Applied Organic Chemistry.** For Dairy Industry students. Principles of organic and bio-chemistry with application to the dairy industry. Prerequisite: 103. Fall, Winter. Lect. and demonstration 2. Lab. 1, 4 hr. Credit 3 each course.

253. **Quantitative Analysis.** For Dairy Industry students. Principles and methods of gravimetric and volumetric analysis applied to the dairy industry. Prerequisite: 252 or 256. Spring. Lect. and demonstration 2. Lab. 1, 4 hr. Credit 3.

255, 256. **Applied Organic Chemistry and Quantitative Analysis.** Fundamentals of the two fields with applications to agriculture. Prerequisite: 103. (255) Fall, Winter. (256) Winter, Spring. Lect. and demonstration 2. Lab. 1, 4 hr. Credit 3 each course.

257. **Applied Organic Chemistry.** For Forestry students. Organic chemistry with applications to the fields concerned. Prerequisite: 102. Spring. Lect. and demonstration 3. Lab. 2, 2 hr. Credit 4.

258. **Applied Organic Chemistry.** For Horticultural students. Continuation of 255 involving applied work specially adapted to the field concerned. Winter. Lect 1. Lab. 1, 3 hr. Credit 2.

259. **Chemistry of Forest Products.** Plant metabolism and plant products. Spring. Prerequisite: 257. Lect. or rec. 2. Credit 2.

264. **Organic Chemistry.** For Home Economics students. The fundamental principles of organic chemistry. Prerequisite: 106. Fall, Winter, Spring. Lect 3. Lab. 2, 3 hr. Credit 5.

265. **Food Analysis.** For Home Economics students. Elementary gravimetric and volumetric analysis and the methods of food analysis. Prerequisite: 264. Fall, Winter, Spring. Lect. 3. Lab. 2, 3 hr. Credit 5.

266. **Food Analysis.** For Home Economic students. An elementary course devoted to methods of analysis. Prerequisite: 264. Fall, Winter, Spring. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

267. **Food Analysis.** For Home Economics students. Completes the work of course 265 omitted in course 266. Prerequisite: 266. Spring. Rec. and demonstration 1. Lab. 1, 3 hr. Credit 2.

268. **Textile Analysis.** For Home Economics students. Elementary gravimetric and volumetric analysis and the analysis of fibers and textiles by chemical and physical methods. Prerequisite: 264. Spring. Lect. and rec. 3. Lab. 2, 3 hr. Credit 5.

274. **Physiological and Nutritional Chemistry.** Fundamental principles of physiological chemistry and the chemistry of nutrition. Prerequisite: 266. Fall, Winter, Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

275. **Physiological and Nutritional Chemistry.** Chemical composition of living matter; metabolism; fundamentals of nutritional chemistry. Prerequisite: 253, 265, or 266. Fall, Winter, Spring. Lect. 3. Lab. 2, 3 hr. Credit 5.

314. **Chemical Technology.** Technical examination of cements, fuels, oils, gas, road materials, boiler waters, and the treatment of boiler water. Prerequisite: 213. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.



321, 322, 323. **Physical Chemistry.** Properties of gases, liquids, and solids; solutions, thermo-chemistry, reaction velocity, electro-chemistry, equilibrium. Prerequisite: 213, Phys. 223, Math. 212, and Chem. 331 as parallel. (321, 322) Fall, Winter. Rec. 3. Lab. 1, 3 hr. Credit 4. (323) Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

331, 332, 333. **Organic Chemistry.** For Chemistry and Chemical Engineering students, and students specializing in pre-medical and applied biological sciences. Prerequisite: 103. Fall, Winter, Spring, respectively. Lect. 2. Rec. 1. Lab. 2, 3 hr. Credit 2 to 5 each course.

345. **Food Analysis.** Methods of analysis, detection of adulterations and interpretation of results. Prerequisite: 253, 265, or 266. Fall, Winter. Lect. 2. Lab. 0 to 3, 3 hr. Credit 2 to 5.

346. **Manufacture of Food Products.** Discussion of raw materials and chemical processes involved. Prerequisite: 253, 265, or 266. Alternate years. Offered Spring, 1938. Lect. 3. Credit 3.

347. **Dairy Chemistry.** Analysis of pure and adulterated dairy products and detection of preservatives and coloring matters. Prerequisite: 253, 265, or 267. Fall. Rec. 2. Lab. 3, 3 hr. Credit 5.

348. **Advanced Dairy Chemistry.** Advanced analytical methods; detailed study of composition and changes of composition occurring in manufacture. Prerequisite: 347. Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.

411, 412. **Chemical Technology.** Gas analysis, calorimetry. Application of analytical methods and commercial tests to industrial materials, control of plants and purchase of supplies. Prerequisite: 213, 322, 333. Winter, Spring, respectively. Rec. 1. Lab. 2, 3 hr. Credit 3 each course.

427. **Physical Chemistry.** (Cer.E. 427.) Applied to processes in ceramic manufacture. Prerequisite: 323. Spring. Rec. 4. Credit 4.

431, 432, 433. **Organic Chemistry.** For chemistry students and those specializing in applied biological sciences. Principles of organic chemistry, including a brief introduction to qualitative organic analysis, and training in the use of chemical literature. Prerequisite: 103. Fall, Winter, Spring, respectively. Lect. 2. Conf. 1. Lab. 2, 3 hr. Credit 3 or 5 each course.

441, 442, 443. **Sanitary Chemistry.** Elements of quantitative analysis; analysis and purification of potable waters; sewage analysis; interpretation of results; planning and organization of sanitary survey work. Alternate years. Offered Fall, Winter, Spring, respectively, 1938-'39. Prerequisite: Qualitative Analysis. Rec. 2. Lab. 2 or 3, 3 hr. Credit 4 to 5 each course.

466. **Textile Chemistry.** For students specializing in Textiles. Quantitative, physical, and chemical analysis of yarns and fabrics; scouring, bleaching, and finishing processes. Prerequisite: 268. Fall, Spring. Lect. 2. Lab. 2, 3 hr. Credit 4.

474. **Physiological and Nutritional Chemistry.** Fundamentals of chemistry in life processes. Prerequisite: elementary organic and analytical chemistry. Fall, Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

495. **Teaching Chemistry.** (Voc. Ed. 495.) Methods of presentation and study of subject matter supported by class and laboratory demonstration. Prerequisite: 15 credits of chemistry including 211, or 331, or equivalent. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

501, 502, 503. **Inorganic Preparations.** Preparation of inorganic compounds. May be taken as laboratory to accompany 605, 606. Fall, Winter, Spring, respectively. Lab. 1 or more, 3 hr. Credit 1 or more each course. Mr. Wilkinson.

511, 512, 513. **Advanced Quantitative Analysis.** Intensive study of analytical processes in the light of modern theories, including difficult separations, electro-metric titrations, indicators, nephelometry, etc. Prerequisite: 213. Fall, Winter, Spring, respectively. Lectures offered alternate years. Fall, 1937. (511) Lect. 3. Lab. 0 to 3, 3 hr. Credit 3 to 6. (512, 513) Lab. 2 or more, 3 hr. Credit 2 or more. Mr. Wilkinson.

514. **Spectrographic Analysis.** Application of spectrographic methods to the analysis of various substances for large and small amounts of many rare and common elements. Prerequisite: Quantitative analysis, Phys. 213. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3. Mr. Wilhelm.

515, 516. **Metallography.** Treats of iron, steel, and other alloys. Prerequisite: Quantitative analysis. Alternate years. Offered Fall, Winter, respectively, 1938-'39. Rec. 2. Lab. 2 or 3, 3 hr. Credit 4 or 5 each course. Mr. Jennings.

518. **Microscopic and Quantitative Micro-Chemical Analysis.** Training in the essential manipulative methods for the microscopic identification of elements and compounds, for micro preparations, and for micro-elementary analysis. Prerequisite: 203, 213, 333. Graduates, Winter. Undergraduates, Fall. Lect. and rec. 1. Lab. 2, 3 hr. Credit 3 each time elected. Mr. Johns.

521, 522, 523. **Advanced Physical Chemistry.** The more important phases of physical chemistry from the standpoint of thermodynamics. Prerequisite: 323. Lect. 2. Lab. 0 to 3, 3 hr. Credit 2 to 5 each course. Mr. Jennings.

525, 526. **Colloids and Catalysis.** (525) A systematic survey of the properties of colloidal systems. (526) Special topics in colloid chemistry; catalysis in homogeneous and heterogeneous systems. Prerequisite: 213, 323. Fall, Spring, respectively. Lect. 2. Lab. 0 or 1, 3 hr. Credit 2 or 3 each course. Mr. Fulmer.

531. **Qualitative and Quantitative Organic Analysis.** Prerequisite: 213, 333. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3. Mr. Gilman.

532, 533. **Intermediate Organic Chemistry.** Problems, abstracts, and reports on selected topics of applied and theoretical importance. Training in the use of chemical literature. Laboratory in quantitative organic analysis. Prerequisite: 531, and reading knowledge of German. (532) Winter. Lect. 2. Lab. 1, 3 hr. Credit 3. (533) Spring. Lect. 2. Credit 2. Mr. Gilman.

535, 536, 537. **Advanced Organic Laboratory.** Involves preliminary research work in synthesis and a study of reactions of compounds of theoretical and industrial importance. Prerequisite: 333. Fall, Winter, Spring, respectively. Lab. 2 or more, 3 hr. Credit 2 or more each course. Mr. Gilman.

545. **Special Topics in Food Chemistry.** Recent developments in food chemistry; detailed study of various food products. Prerequisite: 345. Fall, Winter, Spring. Conference 2 or more. Credit 2 or more each quarter. Mr. Buchanan.

565. **Special Topics in Textile Chemistry.** Recent developments in textile chemistry along technical lines. Prerequisite: 466. Fall, Winter, Spring. Conference 1. Lab. 2 or more, 3 hr. Credit 3 to 5. Miss Edgar.

571, 572, 573. **Advanced Physiological and Nutritional Chemistry.** Chemistry of internal secretions, oxidation, metabolism, nutrition, urine, blood, and tissues. Prerequisite: 275 or 474, and 321, and 531 as parallel. Alternate years. Offered 1938. (571, 572) Winter, Spring, respectively. Lect. 2. Lab. 1, 3 hr. Credit 3 each course. (573) Fall. Lect. 3. Credit 3. Mr. Nelson.

574, 575. **Physiological and Nutritional Chemistry.** Chemistry of digestion, assimilation, and metabolism; advanced nutritional chemistry. Methods of chemical diagnosis. Prerequisite: 275 or 474. Winter, Spring, respectively. Lect. 2. Lab. 0 or 1, 3 hr. Credit 2 or 3 each course. Mr. Nelson.

576. **Special Topics in Physiological Chemistry.** Physiological chemistry applied to dietetics, veterinary medicine, animal nutrition, bacteriology, etc. Prerequisite: 275 or 474. Fall, Winter, Spring. Conference. Lab. 2, 3 hr. or more. Credit 2 or more. Mr. Nelson.

584, 585. **Industrial Zymo-Chemistry.** Chemistry of fermentations with especial reference to the elaboration of chemicals and other industrial materials from agricultural products. Prerequisite: 525, Bact. 560. Alternate years. Offered Winter, Spring, respectively, 1939. Rec. 2. Lab. 1 or more, 3 hr. Credit 3 or more each course. Mr. Underkofler.

586. **Bio-Chemistry.** A series of courses from which sequences may be chosen by graduate students in soils and the biological sciences as minors for the M.S. and Ph.D. degrees or as a part of their majors for either of these degrees.

Soils sequence.

(a) Minor for the M.S. degree:

586F, C, and A.

(b) Minor for the Ph.D. degree:

586F, C, A, G, D, H, and I.

Biological Science sequence,

The following is a suggested sequence:

(a) Minor for the M.S. degree:

586F, C, and A.

(b) Minor for the Ph.D. degree:

586F, C, A, B, D, E, and G.

Laboratory work.

All laboratory work involved in courses listed as 586, with the possible exception of 586J, will be scheduled in one laboratory which will be open each forenoon and afternoon, excepting Saturday afternoon, that there is a sufficient number of students to meet the minimum requirements.

A. **Bio-organic Chemistry.** Brief review of the fundamentals followed by more advanced bio-organic chemistry; training in the use of the literature. Prerequisite: 255. Winter. Lect. and rec. 3. Lab. 1 or 2, 3 hr. Credit 3 to 5. Mr. Hixon.

B. **Bio-organic Chemistry.** Continuation of A, introducing micro-chemical technique and analysis. Spring. Lect. and rec. 3. Lab. 1 or 2, 3 hr. Credit 3 to 5. Mr. Johns.

C. Bio-physical Chemistry. Interpretation and presentation of bio-chemical data. Electro-chemistry as applied to biology. Prerequisite: 253, 256, 265, or 267. Fall. Lect. 3. Lab. 1, 3 hr. Credit 3 or 4. Mr. Fulmer.

D. Bio-physical Chemistry. General properties of solutions. Colloid chemistry. Prerequisite: 253, 256, 265, or 267. Winter. Lect. 3. Lab. 0 to 2, 3 hr. Credit 3 to 5. Mr. Fulmer.

E. Bio-physical Chemistry. Special topics. Prerequisite: 586D. Spring. Lect. 2. Lab. 0 to 3, 3 hr. Credit 2 to 5. Mr. Fulmer.

F. Bio-inorganic Chemistry. Laws and theories relating to elements of special importance in plants, animals, and soils. Prerequisite: 256 or equivalent. Fall. Lect. 3. Credit 3. Mr. Clark.

G. Analytical Bio-chemistry. Advanced quantitative analysis involving methods for inorganic constituents of biological material. Prerequisite: 586F or equivalent. Winter. Lect. 1. Rec. 1. Lab. 2 or 3, 3 hr. Credit 4 or 5. Mr. Clark.

H. Soil Chemistry. The soil organic matter and its composition. Prerequisite: 586G. Alternate years. Spring, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Clark.

I. Physical Chemistry of Soils. Reactions and colloids of the soil. Prerequisite: 586G. Alternate years. Spring, 1939. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Clark.

J. Bio-Chemical Laboratory. For the co-operative development of bio-chemical phases of research problems or the co-operative development of theses in borderland fields for the M.S. and Ph.D. degrees. Fall, Winter, Spring. Credit as arranged. Messrs. Fulmer, Hixon, Clark.

601, 602, 603. Selected Topics in Inorganic Chemistry. Atomic structure, periodic law, valency, ionization, rare elements, radiations, and chemical reactions, etc. Prerequisite: 202. Alternate years. Offered Fall, Winter, Spring, respectively, 1937-38. Lect. 2. Credit 2 each course. Mr. Brown.

605, 606. Systematic Inorganic Chemistry. Prerequisite: 202. Fall, Winter, respectively. Lect. 3. Credit 3 each course. Mr. Wilkinson.

616, 617. Advanced Qualitative Analysis. From the standpoint of mass law and equilibrium. Separation of common and rare elements. Prerequisite: 203, 213. Alternate years. Winter, Spring, respectively, 1939. Rec. 1. Lab. 2, 3 hr. Credit 3 each course. Mr. Wilkinson.

625. Applied Physical Chemistry. Advanced course on the theoretical considerations and industrial applications of free energy data, and other advanced topics. Prerequisite: 323. Fall, Winter, Spring. Lect. 2. Credit 2 each time elected. Mr. Jennings.

631, 632, 633. Advanced Organic Chemistry. Description and theoretical consideration of advanced reactions. Problems, abstracts, and term paper. Prerequisite: 531, reading knowledge of German. Fall, Winter, Spring, respectively. Credit 1 or 2 each course. Mr. Gilman.

655. Special Topics in Plant Chemistry. Carbohydrate chemistry. Isolation, analysis, synthesis, etc., of carbohydrate compounds or their fermentation products. Fall, Winter, Spring. Conference and lab. as arranged. Credit 3 or more. Mr. Hixon.

656. Advanced Plant Chemistry. Chemistry of plant metabolism, analysis of plant tissue, phytochemical preparations, preparatory training for research in plant growth phenomena. Prerequisite: 323, 333, and Botany 102. Alternate years. Offered Winter, 1939. Lect. and conference 3. Credit 3. Mr. Hixon.

658. Soil Chemistry. Physical, analytical, and bio-chemical methods; topic assignments. Prerequisite: 213, 323, 333. Fall, Winter, Spring. Lect. and confer. 2. Lab. 1 or more. Credit 2 or more. Mr. Clark.

659. Soil Chemistry. Soil reaction and solution; colloids of the soil; organic matter; biometric methods. Prerequisite: 658. Fall, Winter, Spring. Lect. 2. Credit 2 each time elected. Mr. Clark.

671, 672, 673. Bio-Chemical Preparations. Isolation, preparation and study of substances from living matter. Development of the experimental viewpoint of nutritional chemistry through animal feeding. Prerequisite: 275 or 474. Fall, Winter, Spring, respectively. Conferences and lab. as arranged. Credit 2 or more each course. Mr. Nelson.

686, 687. Bio-Physical Chemistry. Topic course dealing with the application of the principles and methods of physical chemistry to biology. Prerequisite: 525, and courses in biology. Alternate years. Offered Winter, Spring, respectively, 1938. Lect. 2. Lab. 0 or more, 3 hr. Credit 2 or more each course. Mr. Fulmer.

688. Enzyme Chemistry. Purification of enzyme material, enzymic action upon fats, carbohydrates, protein and other food substances. Preliminary training for research. Prerequisite: 525, and classification in 686. Winter, Spring. Conference 1. Lab. 1 or more, 3 hrs. Credit 2 or more. Miss Naylor.

## 695. Research.

- A. Inorganic Chemistry. Messrs. Wikinson, Brown, King.
- B. Analytical Chemistry. Mr. Wilkinson.
- C. Physical Chemistry. Mr. Jennings.
- D. Organic Chemistry. Mr. Gilman.
- E. Food and Sanitary Chemistry. Mr. Buchanan.
- F. Bio-Physical Chemistry. Mr. Fulmer, Mr. Underkofler.
- G. Physiological and Nutritional Chemistry. Mr. Nelson.
- H. Household and Textile Chemistry. Miss Edgar.
- I. Soil Chemistry. Mr. Clark.
- J. Plant Chemistry. Mr. Hixon, Mr. Johns.
- K. Enzyme Chemistry. Miss Naylor.
- L. Dairy Chemistry. Mr. Buchanan, Mr. Bird.
- M. Special Agricultural Chemistry. Mr. Hixon, Mr. Thomas.
- N. Agricultural By-Products. Mr. Lynch.

## CIVIL ENGINEERING

A. H. FULLER, Head of Department

Professors Caughey, Dodds, Kerekes; Associate Professor Moyer;  
Assistant Professors Galligan, Paustian; Instructor Whisler.

*For information concerning the Division of Engineering, see page 125.*

Engineering has been aptly described as the science and art of applying, economically, the laws, forces, and materials of nature for the use, convenience, and enjoyment of man.

Civil Engineering consists of the economic application of the laws, forces, and materials of nature to the design and construction of highways; railways; bridges; large buildings; water supply, sewerage, irrigation and drainage systems; river and harbor improvements; and other works which are a part of the present day civilization.

An analysis of the positions of the C. E. graduates of Iowa State College shows about one-third of them to be in public work in U. S. Government, State, City and County positions. The others are widely scattered throughout the many phases of civil engineering in positions of all grades of engineering and administrative responsibility.

The curriculum in Civil Engineering has been planned with a foundation of English, mathematics, physics, and chemistry combined with drawing, surveying, mechanics, hydraulics, and economics and with a superstructure consisting of the applications of these subjects to the many phases of civil engineering. Emphasis is given to an understanding of the principles of engineering and of economics and the relation of these principles to efficient engineering practice.

The work on the campus is supplemented by a six-weeks summer camp, which follows the sophomore year; and by three informal inspection trips for the purpose of making first-hand study of engineering work and of industrial plants of particular interest.

The summer camp has been located in the Minnesota State Forest Preserve on Rainy Lake. The camp site is one of America's few remaining spots of unspoiled natural wilderness. In this location is afforded an excellent opportunity for a combination of engineering experience and camp life.

For the inspection trips, the sophomores spend three days at Saint Paul, Minneapolis and Duluth, and on the Mesaba Iron Range, while

enroute to summer camp. The juniors make one-day trips to Des Moines and adjacent places of engineering interest. The seniors spend a week in Chicago, St. Louis or other large centers of engineering activity. All of these trips are carefully planned in advance and are carried out under the joint direction of the faculty and of representatives of the work which is being inspected.

### Curriculum In Civil Engineering

Leading to the degree of Bachelor of Science.

For graduate work, see page 152.

For professional degree, see page 144.

For entrance requirements, see page 99.

#### FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		Applied Chemistry	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 107	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 108	3
College Algebra		Plane Trigonometry		Plane Analytic Geometry	
Math. 101	5	Math. 102C	4	Math. 108	5
Drawing and Projection		Theory of Project. Draw.		Elementary Surveying	
Engr. Dr. 181	2	Engr. Dr. 182	3	C.E. 114	4
Engineering Problems		Engineering Problems		Military 103 or 123	1
Gen.E. 104	1	Gen.E. 105	1		
Military 101 or 121	1	Military 102 or 122	1		
	<u>16</u>		<u>16</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 108; Engr. 114, 115; Library 106C (Winter); Tech. Lect., C.E. 100 (Spring).

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

#### SOPHOMORE YEAR

Topographic Surveying		Working Drawings		Curves and Earthwork	
C.E. 215	5	Engr. Dr. 183	3	C.E. 264	4
		Hydrology and Drainage		Statics of Engineering	
		C.E. 220	3	T.&A.M. 274	3
Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Mechanics and Heat		Elect. and Magnetism		Sound and Light	
Phys. 221	5	Phys. 222	5	Phys. 223	5
Extempore Speaking		Extempore Speaking		Engineering Problems	
P.S. 311	3	P.S. 312	2	Gen.E. 206	1
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	<u>18</u>		<u>18</u>		<u>18</u>

Summer Field Work in Topographic and Route Surveying, six weeks; C.E. 300—9 crs.

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Roads and Pavements		Railway Engineering		Highway Adm. & Design	
C.E. 355	4	C.E. 364	4	C.E. 356	3
Mechanics of Materials		Dynamics of Engineering		Elements of Structures	
T.&A.M. 324	5	T.&A.M. 344	4	C.E. 335	5
Engineering Geology		Materials Laboratory		Cement and Concrete	
Geol. 374	3	T.&A.M. 327	2	T.&A.M. 338	3
Principles of Economics		Properties of Materials		Hydraulics	
Ec. 261	3	T.&A.M. 334	2	T.&A.M. 378	4
†American Government		General Bacteriology		Electives	3
Govt. 315	3	Bact. 304D	3		
		*Electives	3		
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, C.E. 394, 395 (Fall, Spring).

The Junior electives may be advanced courses in any of the non-civil engineering required subjects or an approved sequence in a new subject. The electives must include English 204 unless a quality point average of 2 has been attained in the required courses in English and a correspondingly high standard has been maintained in subsequent written reports. See page 238.

\*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

†May be omitted by students appointed to the Reserve Officers' Training Corps, see page 301.

## SENIOR YEAR

Bridge Analysis		Reinforced Concrete		Structural Analysis	
C.E. 436	5	C.E. 437	5	C.E. 439	5 ✓
Sewerage		Water Supply		Water Power	
C.E. 414	5	C.E. 415	3	C.E. 416	3 ✓
Engineering Reports		Engineering Valuation		Engineering Contracts	
C.E. 484	2	Engr. 407	3	Engr. 405	3
Engineering Construction		Accounting		Corporation Finance	
C.E. 485	3	Ec. 374	4	Ec. 474	3 ✓
*Electives	3	Electives	3	Electives	3
	18		18		17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, C.E. 496, Fall; 497, Winter; Inspection Trip, C.E. 499, Spring.

\*Elective courses shall be chosen after consultation with the counselor.

The Senior electives will be chosen from:

Construction Materials	Bridge Design	Reinforced Concrete Design
T.&A.M. 493 or	C.E. 444 or	C.E. 445 or
Public Works Management	Sewerage	Water Supply
C.E. 405 or	C.E. 417 or	C.E. 418 or
Highways	Railroads	Transportation Surveys
C.E. 456 or	C.E. 466 or	C.E. 477 or
Military Science 401	Military Science 402	Military Science 403

## Description of Courses

100. Technical Lecture. A discussion of the various phases of civil engineering. Lectures by staff members and practicing civil engineers. Spring. Lect. 1. Required.

114. Elementary Surveying. Theory and practice of surveying including care and use of tape, compass, level and transit; field problems including profiles, cross sections, traverses, and area determinations. Prerequisite: Math. 102. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

116. Surveying. Elementary surveying problems; use of chain, compass, level and transit; field methods and notes. Prerequisite: credit or classification in Math. 102. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

215. Topographic Surveying. Centerline surveys, maps, plans, profiles and quantity calculations; triangulation; meridian determination; public land, aerial, underground, and hydrographic surveys. Prerequisite: 114 or 325. Fall. Rec. 2. Lab. 3, 3 hr. Credit 5.

217. **Topographic Surveying.** Leveling, traversing; plane table and other topographic surveys. Prerequisite: 116. Fall. Rec. 1. Lab. 3, 3 hr. Credit 4.

218. **Surveying.** Calculations and office work. Prerequisite: 217. Winter. Rec. 1. Lab. 2, 3 hr. Credit 3.

220. **Hydrology and Drainage.** Principles of hydrology and land drainage. Prerequisite: 215. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

264. **Curves and Earthwork.** Theory and practice in the location of curves on route surveys and in the measurement of earth work on construction projects. Prerequisite: 114. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

300. **Summer Camp.** Engineering field practice in camp during the first term of the summer quarter. Land, topographic, route, and hydrographic surveying. The student pays his own transportation and living expenses and the regular summer term registration fee. Prerequisite: 220, 264. Credit 9.

311, 312, 313. **Surveying.** (311) Level, transit, and stadia. Prerequisite: 116. Fall. Rec. 1. Lab. 3, 3 hr. Credit 4. (312) Calculations and office work. United States Land Survey; hydrographic surveying. Prerequisite: 311. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4. (313) Topographic surveying including triangulation, use of plane table and meridian determinations. Prerequisite: 312. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

325. **Surveying.** Pacing; chaining; leveling; traversing; simple topography; care and use of instruments. Prerequisite: Math. 102. Fall and Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

330. **Mine Surveying.** Chaining, leveling, and traversing underground; use of mining transit. Prerequisite: 325. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

335. **Elements of Structures.** Stresses in beams, girders, and trusses; algebraic and graphic methods. Introduction to the design of steel structures. Prerequisite: T. & A. M. 324. Winter, Spring. Rec. 3. Lab. 2, 3 hr. Credit 5.

336. **Industrial Buildings.** Stress analysis and design of the main features of steel industrial buildings; design of timber truss and mill construction framing. Prerequisite: 335. Spring. Rec. 3. Lab. 2, 3 hr. Credit 5.

354. **Roads and Pavements.** Types of roads and pavements, methods of construction and maintenance, special machinery, costs, comparisons. Prerequisite: 218 or 325. Fall. Rec. 3. Credit 3.

355. **Roads and Pavements.** Theory and practice in design, construction, and maintenance. Road materials testing. Prerequisite: 215, Chem. 107. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

356. **Highway Administration and Design.** Design and financing of rural highways and city pavements. Elements of traffic control. Prerequisite: 264. Spring. Rec. 3. Credit 3.

364. **Railway Engineering.** Railway location based upon the maps made at summer camp. Construction, maintenance, and operation problems of the railway engineer. Prerequisite: 264. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

394. **Seminar.** Oral reports and discussions on engineering organizations and related topics. Fall. 1 hr. Required.

395. **Seminar.** Oral reports and discussions on notable engineering projects. Spring. 1 hr. Required.

404. **Engineering in City Planning.** The relation of sanitary works, transportation and other utilities to city planning; housing, building codes, real estate subdivision, land titles. Prerequisite: Credit or classification in L.A. 401 or senior C.E. classification. Winter. Rec. 3. Credit 3.

405. **Public Works Management.** City and county finance, ordinances, special assessments, building codes, budgets, public relations, public health, public safety, zoning and planning. Prerequisite: credit or classification in 414. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

414. **Sewerage and Sewage Disposal.** Principles of sewerage and sewage treatment. Elements of design of sewage works. Correlated hydraulic laboratory experiments. Prerequisite: Bact. 304D, T. & A.M. 378. Fall. Rec. 3. Lab. 2, 3 hr. Credit 5.

415. **Water Supply.** Fundamentals of the collection, treatment, and distribution of water for public, domestic, and industrial uses. Elements of design of water supply works. Prerequisite: Bact. 304D, T. & A. M. 378. Winter. Rec. 2. Lab. 1. 3 hr. Credit 3.

416. **Water Power.** Rainfall, run-off, and stream flow and their application to water power developments; general principles of water power plant location and design; correlated hydraulic machinery laboratory tests. Prerequisite: T. & A.M. 378. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

417. **Advanced Sewerage and Sewage Disposal.** Principles of a sewage works plan, method of plant control and value of experimental work in sewage treatment. Prerequisite: 414. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

418. **Advanced Water Supply.** Statistical methods applicable to study of surface sources. Quality of water trends, finances, Board of Fire Underwriters requirements and utilization of electricity as related to water supply. Prerequisite: 415. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

419. **Building Sanitation.** Piping systems for water supply and drainage. Principles of water treatment and waste disposal. Design of swimming pools and protection of bathing places. Prerequisite: 438. Winter. Rec. 3. Credit 3.

430. **Mine Surveying.** Precise surveying both surface and underground for mapping and boundary determinations in connection with mine and tunnel surveys; mining claims. Prerequisite: 330. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

436. **Bridge Analysis.** Stresses, investigation of design, and economic features of simple span steel highway bridges. Prerequisite: 335. Fall, Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.

437. **Reinforced Concrete Structures.** Mechanics of reinforced concrete; designs and estimates of concrete structures; earth pressure theories and a brief treatment of foundations. Prerequisite: 335. Fall, Winter. Rec. 2 or 3. Lab. 2, 3 hr. Credit 4 or 5.

438. **Multistory Buildings.** Analysis and design of steel frame commercial buildings for which plans have been prepared in Arch. E. 491; preparation of typical framing plans. Prerequisite: 336, Arch. E. 491. Winter. Rec. 1. Lab. 2, 3 hr. Credit 3.

439. **Advanced Structural Analysis.** Deflection of bridges; introduction to stresses in statically indeterminate structures; design of reinforced concrete arches. Prerequisite: 336 or 436, and 437. Spring. Rec. 3. Lab. 2, 3 hr. Credit 5.

444. **Bridge Design.** Stresses for railway loadings; design of steel highway and railway bridges; bridge specifications. Prerequisite: 436. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

445. **Reinforced Concrete Design.** Theory, design, and economics of concrete and masonry structures such as building frames, culverts, tanks, storm sewers, and bridges. Prerequisite: 437. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

456. **Highways.** Advanced highway design; economic studies of location and grades; super-highway projects; city street improvements; traffic control. Prerequisite: 355, 356. Fall. Rec. 3. Credit 3.

466. **Railroads.** Engineering and related problems in railway maintenance and operation. Prerequisite: 364. Winter. Rec. 3. Credit 3.

477. **Transportation Surveys.** Survey and analysis of the traffic problems of a specific locality with especial emphasis on the co-ordination of the transportation facilities. Prerequisite: 356, 364. Spring. Rec. 3. Credit 3.

484. **Engineering Reports.** Content and form of engineering reports; collection, assembly and interpretation of data; preparation of papers, letters, and reports. Prerequisite: senior college classification. Fall. Rec. 2. Credit 2.

485. **Engineering Construction.** The application of some of the principles of scientific management to engineering construction. Prerequisite: 325 or equivalent, 335, T. & A.M., 338. Fall. Rec. 3. Credit 3.

490. **Advanced Civil Engineering.** Any phase of civil engineering in which the student has done exceptionally strong work. Prerequisite: permission of the department. (Fall, Winter, Spring. Conferences.) Credit 3 to 6.

496. **Seminar.** Oral reports on personal engineering experience. Supplemental biographical sketches of prominent engineers. Written outlines required. Fall. 1 hr. Required.

497. **Seminar.** Oral reports on modern construction methods and equipment. Written outlines required. Winter. 1 hr. Required.

499. **Senior Inspection Trip.** An inspection trip of one week to Chicago, St. Louis or other suitable place. Prerequisite: Senior C.E. classification. Spring. Required.

604. **Public Utilities.** A study from the standpoint of the city manager of the utilities which serve the modern city such as transportation, sanitation, light, heat and power, telephone, telegraph, and radio. Winter. Credit 4. Mr. Dodds.

605. **City Planning.** City planning from the view point of engineering improvements and their relation to other factors in promoting civic welfare. Prerequisite: 414 or L.A. 401. Spring. Credit 4. Mr. Dodds.

606. **Municipal Improvements.** Planning and execution of municipal improvements; sources of funds, federal co-operation, state regulation, auditing, legal procedure, and engineering. Fall. Credit 4. Mr. Dodds.



607. **Municipal Improvements.** Continuation of 606. Winter. Credit 3. Mr. Dodds.

608. **City Manager Problems.** Problems of the man who has charge of the engineering work of a city as city engineer, city manager, advisor to a city plan commission or consulting engineer dealing with the relation of the engineer to the public, to the other city officials, and to other engineers. Spring. Credit 3. Mr. Dodds.

614. **Sanitary Engineering Practice.** Organization and operation of sanitary engineering bureaus and health administration units. Fall. Credit 4. Mr. Galligan.

615. **Water Treatment.** Analysis of the design of modern water treatment plants with critical study of hydraulic features and plant performances. Winter. Credit 3. Mr. Galligan.

616. **Sewage Treatment.** Analysis of the design of modern sewage treatment plants with critical study of hydraulic features and plant performance. Spring. Credit 3. Mr. Galligan.

617. **Hydro-electric Project Analysis.** Controlling factors in a hydro-electric development, including market, financing, design, construction, operation, maintenance, administration. Winter. Credit 4. Mr. Galligan.

634. **Rigid Frames.** Theory and application of various methods of rigid frame analysis including curved beam theory, slope deflection, and moment distribution. Fall. Credit 4. Mr. Caughey.

635. **Office Buildings.** Problems peculiar to the design of office buildings such as stresses in wind bracing, design of spandrel girders, grillage foundations, and floors of various types. Winter. Credit 4. Mr. Caughey, Mr. Kerekes.

636. **Secondary Stresses.** The underlying principles of secondary stresses in framed structures and the design of structures to avoid excessive secondary stresses. Spring. Credit 4. Mr. Fuller.

637. **Industrial Buildings.** Problems peculiar to the design of industrial buildings, such as eccentrically loaded members of the framed bents, framed bents with side sheds, and balconies attached to main columns. Fall. Credit 3. Mr. Caughey, Mr. Kerekes.

638. **Storage Structures.** The design of grain elevators and other storage structures, including a study of the behavior of various materials in bins and tanks. Spring. Credit 3. Mr. Caughey.

639. **Airport Structures.** Stress analysis and design of hangars, shops, and terminal buildings. Prerequisite: 335 or M.E. 420. Credit 5. Mr. Kerekes.

644. **Space Structures.** An introduction to rigorous analysis of complete structures in three planes. Principles, methods and the interpretation of results of stress measurements and deflections. Messrs. Caughey, Fuller, Kerekes.

645. **Highway Pavement Slabs.** An introduction to the analysis of stresses in highway pavements under various subgrade conditions. Interpretation of the behavior of slabs in the laboratory and in service. Messrs. Caughey, Fuller, Kerekes, Spangler.

650. **Highway Safety and Traffic Control.** Principles in highway safety which should be considered in the design of highways and city streets, and traffic control devices. Methods and results of motor vehicle inspection, driver's examinations, and related enforcement measures as a means of promoting highway safety. Mr. Moyer.

654. **Rural Highway Design.** Economic studies in rural highway location, alignment, and grades. Economic comparisons of roadway surfaces. Design of traffic control devices. Fall. Credit 4. Mr. Moyer.

655. **Highway Administration.** Engineering considerations involved in the selection, improvement, and maintenance of highway systems. Winter. Credit 4. Mr. Moyer.

656. **Highway Jurisprudence.** Relation of highway laws and systems of finance to the work of the highway engineer. Spring. Credit 4. Mr. Moyer.

657. **Highway Materials.** Selection, testing, and utilization of materials for highway construction. Fall. Credit 3. Mr. Moyer.

658. **Design of Street Improvements.** Design of pavements, curbs, drainage accessories, intersections, marking systems, lighting, and devices for traffic regulation. Winter. Credit 3. Mr. Moyer.

659. **Highway Specifications.** Preparation of specifications for highway improvements in accordance with state and national standards. Spring. Credit 3. Mr. Moyer.

664. **Economics of Railway Location.** Economic study of a railway location taking into account rise and fall, distance, curvature, type of power and traffic possibilities. Fall. Credit 4. Mr. Moyer.

674. **Airport Design.** Selection of site, layout of airports, design of coverage for runways and fields, air and surface traffic aids. Prerequisite: 325, 355. Credit 4. Mr. Stewart.

677. **Transport Surveys.** Analysis of operation of transportation agencies. Fall. Credit 4. Mr. Moyer.

679. **Co-ordinated Transportation Systems.** Engineering and transport problems encountered in the co-ordination of railway, highway, waterway, and airway traffic. Spring. Credit 4. Mr. Moyer.

690. **Research.** Messrs. Caughey, Dodds, Fuller, Galligan, Kerekes, Moyer, Schlick, Spangler.

## CO-OPERATIVE COURSES

C. E. FRILEY, President  
In Charge

It is increasingly apparent that technical students as well as others need training in college which will enable them to appreciate and apply the principles of art in their professional work. Such training will also enable them to enjoy life more fully and to take a more active part in its wider activities. Accordingly, the College has introduced the following courses which are administered by special committees under the general direction of the President.

### Appreciation of the Arts

Committee Members: Anson Marston, Senior Dean of Engineering, Chairman; Professors Cox, Elwood, Joanne Hansen, Kimball; Associate Professors Mabel Fisher, O'Bryan; Assistant Professors Kooser, Livingston, Phillips; Instructors D. P. Ayres, Mrs. Ness

A special art collection purchased by a \$5000 Carnegie Corporation grant for this purpose furnishes the materials for the course. Large colored reproductions and colored lantern slides are used extensively.

### Description of Courses

401, 402, 403. **Appreciation of the Arts.** A course of 31 weekly presentations and discussions of examples of art as expressed in architecture, landscape architecture, painting, sculpture, and the wood, metal, ceramic and textile crafts. The art subjects are presented and explained by a staff of members of the Appreciation of the Arts Committee, with some outside assistance. Prerequisite: senior college classification. Fall, Winter, Spring. Lect. 1 (no outside preparation). Total credit 1.

See also A. A. 484, Art Appreciation, p. 256.

Arch. E. 351, 352, 353. History of Architecture, p. 191.

Arch. E. 384, 385, 386. Principles of Architectural Design, p. 191.

Mus. 144, Music Appreciation, p. 304.

### National, State, Regional and Town Planning

Committee Members: Professor P. H. Elwood, Chairman; Deans Agg, Kildee; Professor T. W. Schultz

The benefits and limitations of planning should be familiar to all technical and professional students. Intelligent co-operation of Agri-

culturists, Architects, Conservationists, Economists, Engineers, Foresters, Landscape Architects, Town Planners, Sociologists, and other scientists is fundamental and essential. Each should find his most effective niche in the complex pattern of the future.

The experience of the past, the trend of the present and the possible future developments in the broad field of planning will be presented in this series by leaders in the various professions involved.

### Description of Course

414. **National, Regional, State and Town Planning.** A series of lectures on collaborative planning aimed to present in outline form the rational approach and the essentials of the various elements as well as the need for mutual understanding and helpful co-operation to insure future physical, economic and social welfare. Prerequisite: senior college classification. Winter. Lect. 2. Credit 2.

## DAIRY INDUSTRY

M. MORTENSEN, Head of Department

Professors Hammer, Iverson; Associate Professor Goss; Assistant Professors Baker, Bird; Instructors Bryant, Fabricius, Hostetler, Olson, Te Selle; Assistants Medin, Nielsen

Extension Workers Bouska, Cromer, Rudnick, Weaver, Wester

*For information concerning the Division of Agriculture, see page 120.*

The Department of Dairy Industry offers a four-year curriculum which qualifies students to become competent teachers and investigators in agricultural colleges and experiment stations; inspectors of dairy products and dairy establishments in municipal, state, and government service; or superintendents and managers of creameries and other dairy establishments. The Dairy Industry Department occupies a building with modern laboratories and equipment. The milk from the college herd, together with the milk and cream shipped and hauled to the college, supplies all needs of the manufacturing laboratories.

### Curriculum In Dairy Industry

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 177.

For entrance requirements, see page 99.

## FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101 <sup>1</sup>	2	A.H. 102	2	A.H. 103	2
General Chemistry		General Chemistry		General Chemistry	
Chem. 101	4	Chem. 102	4	Chem. 103	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
Dairy Mechanics		General Botany		General Horticulture	
A.E. 157	2	Bot. 101	3	Hort. 114	3
Farm Dairying		**Mathematics		Physics	
D.I. 114	4	Math. 205	4	Phys. 204	3
Military 121	1	Military 122	1	Military 123	1
	<u>16</u>		<u>17</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., D.I. 110 (Spring); Orientation Ag. 101, 102; Ag. 104, see page 177.

\*\*College Algebra, Math. 101 (5), may be substituted for Math. 205.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

Cheese Making		Milk Test. & Inspection		American Government	
D.I. 115	5	D.I. 116	3	Govt. 315	3
Breeds of Livestock		Poultry Husbandry		Poul. Pack. Plant Probs.	
A.H. 201	3	A.H. 144	3	A.H. 146	3
Applied Organic		Applied Organic		Quantitative Analysis	
Chem. 251	3	Chem. 252	3	Chem. 253	3
Gen. Agr. Economics		Gen. Agr. Economics		Gen. Agr. Economics	
Ec. 231	3	Ec. 232	3	Ec. 233	3
Extempore Speaking		Dairy Machinery		Reasoning and Writing	
P.S. 311	2	A.E. 239	5	Engl. 205	3
Military 221	1	Military 222	1	Extempore Speaking	
				P.S. 312	2
				Military 223	1
	<u>17</u>		<u>18</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

Judging Dairy Products		Dairy Bacteriology		Ice Cream and Ices	
D.I. 307	1	D.I. 350	6	D.I. 306	4
General Bacteriology		Dairy Chemistry		Manufacture of Butter	
Bact. 304A	5	Chem. 348	5	D.I. 304	5
Dairy Chemistry		Elementary Accounting		Market Milk	
Chem. 347	5	Ec. 370	4	D.I. 305	3
†Dairy Cattle Feed. & Mgt.		Electives	2	Butter Cultures	
A.H. 337	3			D.I. 507	2
General Farm Crops				Creamery Accounting	
F.C. 324	4			Ec. 380	3
	<u>18</u>		<u>17</u>		<u>17</u>

## SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Condensed Milk Prod.		Mgt. of Dairy Plants		Economic History	
D.I. 404	4	D.I. 504	6	Hist. 324	3
Seminar		Dairy Industry Review		Agricultural Advertising	
D.I. 505	2	D.I. 506	3	T.Jl. 325	2
Principles of Breeding		Feature Writing		Soil Fertility	
A.H. 454	3	T.Jl. 335	3	Soils 264	3
Business Law		Electives	5	Business Correspondence	
Ec. 365	3			Engl. 404	2
Technical Journalism				Electives	7
T.Jl. 225	3				
Electives	2				
	<hr/> 17		<hr/> 17		<hr/> 17

†May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 301.

Advised Electives—L.A. 206 (2); F.C. 404 (3).

The following elective subjects are suggested for students specializing in commercial work: A.H. 440; D.I. 308, 309, 554, 555, 556, 557; Ec. 304, 540; Psych. 204, 484, 538, 564.

## Curriculum In Dairy Industry and Chemistry

Leading to the degree of Bachelor of Science.

## Entrance Requirements

See also entrance requirements, page 99.

Applicants for admission to the curriculum in Dairy Industry and Chemistry must present a total of not less than 1 year (45 quarter or 30 semester credits) of work in an approved college or university. The college credits must include:

1. English 9 quarter credits ( 6 semester credits)
2. German or French 9 quarter credits ( 6 semester credits)  
(German preferred)
3. Chemistry 12 quarter credits ( 8 semester credits)  
(Should include qualitative analysis)
4. Electives 15 quarter credits (10 semester credits)

For those who wish to take their preliminary work at Iowa State College, the Division of Industrial Science offers excellent facilities. Deficiencies in entrance credits can be made up here not only during the college year but also during the summer sessions.

Six months of practical work under the direction of the department is required before graduation. See page 177.

There is an increasing demand for men who are qualified to do research in dairy industry. Such men should be well prepared in the fundamental sciences, such as chemistry, bacteriology, physics, and mathematics. In order to prepare students for that field of work a four-year curriculum is offered by the Departments of Dairy Industry and Chemistry.

## FIRST YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Quantitative Analysis		Quantitative Analysis		Quantitative Analysis	
Chem. 211	4	Chem. 212	4	Chem. 213	4
French or German*		French or German*		French or German*	
M.L. 411 or 441	3	M.L. 412 or 442	3	M.L. 413 or 443	3
College Algebra		Plane Trigonometry		Analytic Geometry	
Math. 101	5	Math. 102A	5	Math. 103	5
Livestock Problems		Farm Dairying		Livestock Problems	
A.H. 101	2	D.I. 114	4	A.H. 103	2
Military 121 or 221	1	Military 122 or 222	1	Extempore Speaking	
				P.S. 311	2
				Military 123 or 223	1
	<hr/> 15		<hr/> 17		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

\*German preferred.

## SECOND YEAR

Organic Chemistry		Organic Chemistry		Organic Chemistry	
Chem. 331	5	Chem. 332	5	Chem. 333	5
Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Cheese Making		Milk Test. & Inspection		American Government	
D.I. 115	5	D.I. 116	3	Govt. 315	3
Extempore Speaking		Technical Journalism		Feature Articles	
P.S. 312	2	T.Jl. 225	3	T.Jl. 335	3
	<hr/> 16		<hr/> 15		<hr/> 15

## THIRD YEAR

Judging Dairy Products		Dairy Bacteriology		Manufacture of Butter	
D.I. 307	1	D.I. 350	6	D.I. 304	5
Dairy Chemistry		Dairy Chemistry		Butter Cultures	
Chem. 347	5	Chem. 348	5	D.I. 507	2
General Bacteriology		General Physics		Market Milk	
Bact. 304A	5	Phys. 212	4	D.I. 305	3
General Physics				General Physics	
Phys. 211	4			Phys. 213	4
Electives	2			Electives	2
	<hr/> 17		<hr/> 15		<hr/> 16

## FOURTH YEAR

Condensed Milk Prod.		Mgt. of Dairy Plants		Manuf. of Ice Cream & Ices	
D.I. 404	4	D.I. 504	6	D.I. 806	4
Seminar		Physical Chemistry		D. I. Review	
D.I. 505	2	Chem. 322	4	D.I. 506	3
Bact. of Butter & Cheese				Physical Chemistry	
D.I. 556	2			Chem. 323	4
Laboratory in 556				Physiological Chemistry	
D.I. 557	2			Chem. 474	3
Physical Chemistry					
Chem. 321	4				
Electives	2	Electives	6	Electives	2
	<hr/> 16		<hr/> 16		<hr/> 16

## Curriculum In Dairy Industry and Economics

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

Six months of practical work under the direction of the department is required before graduation. See page 177.

Opportunities are presented in modern dairy organization. for men who have a thorough technical knowledge of dairy industry and who are also well trained in applied economics. This training, together with subsequent successful practical experience, should prepare men for responsible executive and administrative positions in the commercial field.

## FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		General Chemistry	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
Mathematics & Statistics		Mathematics & Statistics		Mathematics & Statistics	
Math. 241	4	Math. 242	4	Math. 243	4
Farm Dairying		Physics		Soil Fertility	
D.I. 114	4	Physa. 204	3	Soils 264	3
				Livestock Problems	
				A.H. 103	2
Military 121	1	Military 122	1	Military 123	1
	<u>16</u>		<u>15</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., D.I. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 177.

## SOPHOMORE YEAR

Breeds of Livestock		Poultry Husbandry		Poul. Pack. Plant Probs.	
A.H. 201	3	A.H. 144	3	A.H. 146	3
Applied Organic		Applied Organic		Quantitative Analysis	
Chem. 251	3	Chem. 252	3	Chem. 253	3
Gen. Agr. Economics		Gen. Agr. Economics		Gen. Agr. Economics	
Ec. 231	3	Ec. 232	3	Ec. 233	3
Cheese Making		Milk Test. & Inspection		Economic History	
D.I. 115	5	D.I. 116	3	Hist. 324	3
Extempore Speaking		Dairy Machinery		Reasoning and Writing	
P.S. 311	2	A.E. 239	5	Engl. 205	3
				Extempore Speaking	
				P.S. 312	2
Military 221	1	Military 222	1	Military 223	1
	<u>17</u>		<u>18</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

Judging Dairy Products		Dairy Bacteriology		Ice Cream and Ices	
D.I. 307	1	D.I. 350	6	D.I. 306	4
Dairy Chemistry		Adv. Dairy Chemistry		Manufacture of Butter	
Chem. 347	5	Chem. 348	5	D.I. 304	5
General Bacteriology		Elementary Accounting		Market Milk	
Bact. 304A	5	Ec. 370	4	D.I. 305	3
Dairy Cattle Feed. & Mgt.		American Government		Butter Cultures	
A.H. 337	3	Govt. 315	3	D.I. 507	2
General Farm Crops				Creamery Accounting	
F.C. 324	4			Ec. 330	3
	<u>18</u>		<u>18</u>		<u>17</u>

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Condensed Milk Prod.		Manage. of Dairy Plants		Money and Banking	
D.I. 404	4	D.I. 504	6	Ec. 304	8
Seminar		Dairy Industry Review		Market Price Determination	
D.I. 505	2	D.I. 506	3	Ec. 538	8
Principles of Breeding		El. Economic Statistics		Business Correspondence	
A.H. 454	3	Ec. 234	4	Engl. 404	2
Business Law		Feature Articles		Technical Advertising	
Ec. 865	3	T.Jl. 835	3	T.Jl. 825	2
Advanced Accounting		Electives	1	Electives	7
Ec. 875	3				
Technical Journalism					
T.Jl. 225	3				
	<u>18</u>		<u>17</u>		<u>17</u>

## Description of Courses

For description of non-collegiate courses, see page 346.

110. **Technical Lecture.** The field of dairy industry, its opportunities, requirements and organization. Spring. Lect. 1. Required.

114. **Farm Dairying.** Development and organization of the dairy industry, composition and properties of milk, methods of manufacturing dairy products and improving their quality. Fall, Winter, Spring. Lect. 3. Lab. 1, 3 hr. Credit 4.

115. **Cheese Making.** Selection of milk; manufacture and curing raw and pasteurized milk cheddar; cream, neufchatel, and cottage; marketing. Prerequisite: 114. Fall. Lect. 3. Lab. 1, 6 hr. Credit 5.

116. **Testing and Inspection of Milk and its Products.** Tests for fat, solids, acidity preservatives, etc., used in the dairy plant and milk control laboratory; use of Mojonnier tester. Prerequisite: 114. Winter. Lect. 2. Lab. 1, 3 hr. Credit 3.

304. **Manufacture of Butter.** Separation of milk for buttermaking, preparation of starters, and ripening and churning of cream. Prerequisite: 116 except for Dy. Husb. students. Spring. Lect. 3. Lab. 3, 2 hr. Credit 5.

305. **Market Milk.** Sanitary production and processing of the milk supply; milk inspection systems and marketing of milk. Prerequisite: 116 and 350; 350 for Dairy Husbandry students. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

306. **Manufacture of Ice Cream and Ices.** Care and preparation of materials used. Plain and fancy ice creams and related products. Prerequisite: 116. Spring. Lect. 3. Lab. 1, 3 hr. Credit 4.

307, 308, 309. **Judging Dairy Products.** Milk, cheese, butter, and ice cream. (307) Fall. (308) Spring. (309) Fall. Lab. 1, 3 hr. Credit 1 each course.

310. **Dairy Principles.** The obtaining of milk, processing and handling of milk and other dairy products from the viewpoint of the agricultural engineer. Spring. Lect. 2. Credit 2.

350. **Dairy Bacteriology.** (Bact. 350.) Bacteria in milk and its derivatives; the production and handling of dairy products from the hygienic viewpoint. Prerequisite: Bact. 304A. Winter. Lect. 4. Lab. 3, 2 hr. Credit 4 or 6.

404. **Condensed Milk Products.** Manufacture of condensed and powdered milks, casein, and milk sugar. Prerequisite: 116. Fall. Rec. 3. Lab. 1, 3 hr. Credit 4.

405. **Milk Inspection.** Testing of milk and cream by the Babcock methods. Inspection of milk and milk products. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

407. **Special Problems in Dairy Manufacturing.** Advanced work in some special phase of dairy products manufacturing. Prerequisite according to the topic selected. Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3.

450. **Special Dairy Bacteriology.** (Bact. 450.) Laboratory investigations, assigned readings and reports on bacteriological problems relating to dairying. Prerequisite: 350. Fall, Winter, Spring. Credit 2 to 6.

504. **Management of Dairy Plants.** Organization, construction, and operation of dairy establishments. Prerequisite: 304, 305, 306. Winter. Rec. 5. Lab. 1, 3 hr. Credit 6. Mr. Mortensen.

505. **Seminar.** Advanced work in dairy problems and reviews of experiment station work. Prerequisite: 504. Fall. Lect. 2. Credit 2. Messrs. Goss, Baker, Bird.



506. **Dairy Industry Review.** A review of technical subject matter followed by a final examination. Prerequisite: 350, 504, Chem. 348. Winter. Rec. 3. Credit 3. Messrs. Mortensen, Hammer, Goss, Iverson.

507. **Butter Cultures.** Judging and propagating; development from pure cultures of organisms. Prerequisite: 350. Spring. Rec. and lab. 2, 2 hr. Credit 2. Mr. Hammer, Mr. Olson.

508. **Foreign Varieties of Cheese.** Selection of milk, manufacture, curing, and marketing of Swiss, brick, Limburger, Roquefort, Camembert, etc. Special attention given to cultures and control of curing. Prerequisite: 115. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Goss.

554. **Bacteriology of Milk.** (Bact. 554.) The various problems in connection with the handling and supervision of milk supplies. Prerequisite: 350. Spring. Lect. 2. Credit 2. Mr. Olson, Mr. Baker.

555. **Laboratory Work in Bacteriology of Milk.** (Bact. 555.) To accompany 554. Spring. Lab. 3, 2 hr. Credit 2. Mr. Olson, Mr. Baker.

556. **Bacteriology of Butter and Cheese.** (Bact. 556.) The desirable and undesirable bacteriological changes occurring in cream intended for butter making and in butter and cheese. Prerequisite: 350. Fall. Lect. 2. Credit 2. Mr. Hammer, Mr. Olson.

557. **Laboratory Work in Bacteriology of Butter and Cheese.** (Bact. 557.) Outlined to accompany 556. Fall. Lab. 3, 2 hr. Credit 2. Mr. Olson.

600. **Dairy Production in Foreign Countries.** Development of dairying in the various countries and the world markets for dairy products. Prerequisite: 504. Alternate years. Offered Spring, 1939. Rec. 2. Credit 2. Mr. Mortensen.

604, 605. **Conference in Dairy Manufacturing.** Recent developments in the manufacture of butter and ice cream. Alternate years. (604) Offered Fall, 1938. Lect. 1. Credit 1. (605) Offered Spring, 1939. Lect. 1. Credit 1. Mr. Mortensen, Mr. Iverson.

606. **Research in Manufacture of Butter.** Prerequisite: 304. Mr. Mortensen, Mr. Bird.

607. **Research in Manufacture of Ice Cream.** Prerequisite: 306. Mr. Iverson, Mr. Bird.

608. **Research in Market Milk.** Prerequisite: 305. Mr. Hammer.

609. **Research in Manufacture of Cheese.** Prerequisite: 115. Messrs Goss, Hammer, Bird.

625. **Research in Management of Dairy Plants.** Prerequisite: 504. Mr. Mortensen, Mr. Goss.

650. **Conference in Dairying.** Reports and discussions on current investigations. Mr. Hammer.

655. **Conference in Dairy Bacteriology.** (Bact. 655.) Discussions of bacteriological problems relating to the various phases of dairying. Spring. Lect. 2. Credit 2. Mr. Hammer.

656. **Identification of the Organisms Common in Dairy Products.** (Bact. 656.) Identification and relationships of the desirable and undesirable organisms commonly encountered in dairy products. Fall. Lect. 2. Lab. 3, 2 hr. Credit 4. Mr. Hammer, Mr. Olson.

660. **Seminar.** Reports on investigational work at Iowa State College and elsewhere. Spring. Lect. 1. Credit 1. Mr. Hammer.

690C. **Research in Dairy Bacteriology.** (Bact. 690C.) Prerequisite: 350. Messrs. Hammer, Baker, Olson.

## ECONOMICS AND SOCIOLOGY

T. W. SCHULTZ, Head of Department

Professors Fuller, Hoyt, Robotka, Von Tungeln; Associate Professors Allbaugh, Benedict, Hopkins,\* Murray, Reid, Shepherd, Thomson, Wakeley, Wright; Assistant Professors Anderson, Cook, Manning, Schickele, Schramper, Stigler, Wilcox; Instructors Bowman, Dachtler, Elkinton, Greaves, Prugh, Quintus; Graduate Assistants Anderson, Atkinson, Austin, Bee, Bitting, Comish, Foote, Whitmore; Fellows Carrithers, Stauss; Scholars Richard, Shapiro; Extension Workers Arthur, Bentley, Buchanan, Cady,\* Cowden, Dillon, Eager, Folken, Fish, Galloway, Hamilton, Howell, Macy,\* Maakestad, Oderkirk, Soth,\* Stacy,\* Thompson, Wallace.

\*Absent on leave.

*For information concerning the Division of Industrial Science, see page 131.*

The department offers major work in the following fields: Agricultural Economics, General Economics (including consumption economics); Industrial Economics (including engineering economics); Rural Sociology.

The department seeks to analyze and present to students the nature of economic and social forces as they affect the value of agricultural and industrial commodities and the well-being of the farming and urban population, and to teach the principles underlying individual and social adjustment to these forces. Major work is offered in the following four curricula:

**Curriculum in Agricultural Economics and Rural Sociology.** See page 165

**Curriculum In Industrial Science—Major In Industrial Economics**

This curriculum is designed for those students who are interested in certain specialized fields of scientific activity, particularly as they relate to the practical aspects of industry, commerce, and engineering.

For freshman and sophomore years, see page 285.

For junior and senior years, see page 286.

### **\*Description of Courses**

\*Only one of the following Economic courses may count for credit toward graduation: 201, 211, 231, and 261; and the same rule applies to 202, 212, 232, and 262; 203, 213, 233, and 263.

**110. Technical Lecture.** The field of agricultural economics and rural sociology. Spring. Lect. 1. Required.

**201, 202, 203. Principles and Problems of Economics.** For Industrial Science students. Not open to freshmen. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

**211, 212, 213. Principles of Economics.** Including consumption. For Home Economics students. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

**231, 232, 233. General Agricultural Economics.** (231) Farm Organization and Management. A consideration of the economic factors involved in the successful organization and operation of a farm. Fall, Winter. (232) Principles of value and price developed in connection with farm marketing problems; marketing methods; market price; supply and demand and their determinants; elasticity of demand and supply. Prerequisite 231 or equivalent. Winter, Spring. (233) Principles of distribution developed around the problems of farm income, cost of production and price, labor and wages, savings and interest, land and rent, profits as a reward for business enterprise, and risk taking. Prerequisite: 232. Fall, Spring. Rec. 3. Credit 3 each course.

**234. Elementary Economic Statistics.** The principles and methods of gathering, analyzing, presenting, and interpreting economic data. Fall, Winter. Rec. 3. Lab. 1, 3 hr. Credit 1 or 4. Students who are classified in or have received credit in Math. 441 may enroll in the laboratory of this course for 1 credit. In all other cases both recitation and laboratory will be required.

**261, 262, 263. Principles and Problems of Economics.** For Engineering students. Not open to freshmen. (261) Fall, Winter, Spring. (262) Winter, Spring. (263) Spring. Rec. 3. Credit 3 each course.

**304. Money and Banking.** Principles of money and credit; survey of American financial institutions; practical operations of commercial banks. Prerequisite: 201 or equivalent. Fall, Winter, Spring. Rec. 3. Credit 3.

**330. Creamery Accounting.** Specialized accounting systems for creameries. Construction and interpretation of creamery operating statements and balance sheets. Prerequisite: 370 or equivalent. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

**334. Land Economics.** Problems in land ownership. Land tenure. Factors affecting the value of farm land. Selling practices. Regional changes in land utilization. Prerequisite: 233 or equivalent. Fall. Rec. 3. Credit 3.

335. **Co-operation in Agriculture.** The co-operative type of business enterprise with particular reference to its application in farm marketing. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

336. **Farm Management and Accounting.** Principles of farm organization and management applied to Iowa farming. Technique of farm management including the use of farm accounting data. Prerequisite: 233 or equivalent. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

365. **Business Law.** Fundamental principles of law as applied to business transactions. Fall, Winter, Spring. Rec. 3. Credit 3.

366. **Advanced Business Law.** Continuation of 365. Emphasis on credit transactions, employment relations, non-contractual rights and liabilities. Prerequisite: 365. Winter. Rec. 3. Credit 3.

370. **Elementary Accounting.** Fundamental accounting principles common to all business enterprises. Winter, Spring. Rec. 2. Lab. 1 or 2, 3 hr. Credit 3 or 4.

374. **Accounting.** Preparation and analysis of balance sheet and profit and loss statement. Double entry bookkeeping, significance of assets, liabilities, expenses, and incomes. Prerequisite: 261 or equivalent and senior college classification. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

375. **Advanced Accounting.** Analysis of financial statements, application of accounting methods as an instrument of business control. Prerequisite: 370 or 374. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

376. **Cost Accounting.** Methods of determining and analyzing costs of materials; processes of labor and machines; distribution of direct and overhead costs; preparation of cost reports. Prerequisite: 370 or 374. Fall, Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

384. **Principles of Sociology.** Essential characteristics of social life, social influences upon the development of personality and attitudes, dominant features and trends of contemporary society, social crises, social changes. Fall, Winter, Spring. Rec. 3. Credit 3.

385. **Sociology of the Family.** Universal elements of family life, comparison of family systems of different societies, the effect of social change on the modern family, nature and problems of interrelationships among family members. Prerequisite: 384. Fall, Winter, Spring. Rec. 3. Credit 3.

386. **Introduction to Rural Sociology.** Rural social problems. Development and functioning of basic rural social institutions. Cultural backgrounds, standards and methods as related to co-operative efforts and social change. Fall, Winter, Spring. Rec. 3. Credit 3.

396. **Forest Finance.** (For. 396.) Appraisal of forest land and stumpage. Determination of the profit of forests compared with other land uses. Land classification, forest taxation and credit. Prerequisite: 231. Spring. Rec. 4. Credit 4.

406. **Industrial Relations.** Relations of employer and employee under present conditions of industry. Matters of public policy such as labor legislation and social insurance. Prerequisite: 202 or equivalent. Spring. Rec. 3. Credit 3.

438. **Lumber Markets.** (For. 438.) Economics of the timber industry. Wholesale and retailing. Exports and imports of lumber and other forest products; prices; lumberman's associations; freight rates; etc. Prerequisite: 231. Winter. Lect. and rec. 4. Credit 4.

470. **General Forestry Economics.** (For. 470.) Elementary application of economics to forestry. Production, distribution, and consumption of forest products. Production management of forests. Prerequisite: 231. Spring. Rec. 3. Credit 3.

474. **Corporation Finance.** Principles of financial organization and management. Types of corporate securities, financing of new corporations and their later management, and reorganizations. Prerequisite: 261 or equivalent. Antecedents suggested: 262, 374. Fall, Spring. Rec. 3. Credit 3.

480. **Industrial Sociology.** Study and evaluation of leadership and welfare work in industry—industrial health, housing, recreation, retirement pensions, unemployment insurance, joint-representation and management, stabilization, etc. Winter, Spring. Rec. 3. Credit 3.

484. **Recreational Activities.** Theory and practice in making and supervising recreational programs to develop voluntary leaders for group recreation and to strengthen community organization. Prerequisite: 384 or equivalent. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

499. **Special Problems.** Prerequisite: 203 or equivalent, and 386 for Rural Sociology. As arranged. Fall, Winter, Spring. Credit 1 to 5.

- A. Agricultural Economics.
- B. Consumption Economics.
- C. Industrial Economics.
- D. Rural Sociology.

**500. International Economics.** International division of labor, comparative costs, distinguishing features of international transactions, comparative price levels, foreign exchanges, balance of trade, tariffs. Prerequisite: 203 or equivalent. Winter. Rec. 3. Credit 3. Mr. Schultz.

**504. Money and Banking.** American banking history; structure and operations of the Federal Reserve System; American monetary and banking policies; credit control. Prerequisite: 203 or equivalent and 304. Winter. Rec. 3. Credit 3. Mr. Wright.

**505. Public Finance.** Taxation, public debts, and public expenditures with special reference to state and local finance. Prerequisite: 203. Fall. Rec. 3. Credit 3. Mr. Wright.

**507, 508. Value and Distribution.** Value determining forces as applied to both general commodities and production goods and services. Prerequisite: 203. Winter, Spring, respectively. Rec. 3. Credit 3 each course. Mr. Hopkins.

**510. Land Use.** Elementary outlines of land economics. Landlord-tenant relationships. Absentee landlordism. Land values and taxations. Public finance of local governments. Land classification. Rural zoning. Prerequisite: 203 or equivalent. Credit 3 or 4. Summer. Mr. Schickele.

**514. Economics of the Household.** Economic significance of productive services of household and problems of household as a field of national production. Prerequisite: 212. Fall. Rec. 3. Credit 3. Miss Reid.

**515. Consumers' Marketing.** Economic forces affecting the market, with special reference to consumers' goods. Prerequisite: 212. Winter. Rec. 3. Credit 3. Miss Reid.

**516. Standards of Living.** American and foreign scales and standards of living. The influences creating them, their cultural significance. Prerequisite: 213. Spring. Rec. 3. Credit 3. Miss Hoyt.

**517. Housing.** (H. Mgt. 517.) Expenditures, factors affecting demand for and supply of housing, regulations pertaining to housing, house ownership, organizations promoting better housing. Prerequisite: 212. Spring. Rec. 3. Credit 3. Miss Reid.

**518. Family Finance.** (H. Mgt. 518.) Earning and spending income to increase its adequacy and insure economic security. Budgeting, accounting, consumers' credit, investments, control of property. Prerequisite: 212. Winter, Spring. Rec. 2. Credit 2. Miss Reid.

**530. Advanced Farm Organization and Management.** Technique of farm organization and management, particularly as developed in Iowa farming. Prerequisite: 233 or equivalent. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Allbaugh.

**534. Farm Accounting.** Principles of accounting adapted to the farm business. Application of accounting data to farm management. Prerequisite: 233, 370. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2. Mr. Hopkins.

**535. Agricultural Finance.** Financial requirements of individual farmers and of farm co-operative organizations. Farm credit policy. The Farm Credit Administration and other leading institutions. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3. Mr. Murray.

**536. Business Cycles.** An analysis of the characteristic movements of prices; their position relative to the general price level and the business cycle. Prerequisite: 233. Spring. Rec. 3. Credit 3. Mr. Hopkins.

**537. Statistical Analysis.** Correlation analysis; methods of analysis of prices, production data and similar series of time variables. Prerequisite: 234 or Math. 441. Winter. Rec. 3. Lab. 2, 3 hr. Credit 5. Mr. Hopkins.

**538. Market Price Determination.** Price making in the market place. Relationship among farm wholesale and retail prices. Speculation and prices. Prerequisite: 233 or equivalent. Spring. Rec. 3. Credit 3. Mr. Shepherd.

**540. Economic Geography of Agriculture.** Geographic and economic survey of the conditions under which the world's supplies of agricultural products are obtained; trade routes; centers of trade in agricultural products. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3. Mr. Schickele.

**545. Transportation.** Development of means of transportation including highways, waterways and railways; relation of transportation to agriculture, general industry, and the formation of market centers. Prerequisite: 203. Fall. Rec. and lect. 3. Credit 3. Mr. Schramper.

**546. Railway Traffic and Rates.** Theory and practice of rate making and regulation; traffic practice and problems; effect of rates on production and trade. Prerequisite: 545. Winter. Rec. 3. Credit 3. Mr. Schramper.

**547. Agricultural Policy.** The relation of agriculture to the economic life of the nation. Problems arising out of the agricultural and industrial development. Prerequisite: 233 or equivalent. Fall. Rec. 3. Credit 3. Mr. Schultz.

**550. Land Income and Policy.** Land as a factor of production. Economics of land utilization. Theories of rent. Principles of land valuation and taxation. Educational policies pertaining to land use. Conservation. Legislation. Recent tendencies in land use planning. Prerequisite: 203 or equivalent. Credit 3. Summer. Mr. Schultz.

**560. Economics of Public Utilities.** To acquaint the student with the development, economic characteristics, and management of public utilities. Prerequisite: 203 or equivalent, 374. Spring. Rec. 3. Credit 3. Mr. Fuller.

**564. Corporate Organizations.** Organization and control of corporations and other forms of business. Procedure of incorporation, relationships of the parties in the corporation and combinations of corporations in large industrials and utilities. Prerequisite: 261 or equivalent, 365, 374. Spring. Rec. 3. Credit 3. Mr. Schramper.

**568. Industrial Marketing.** From the standpoint of the manufacturer. Merchandising channels, sales organization, sales engineering, and co-ordination of sales and production. Prerequisite: 263, 374. Winter. Rec. 5. Credit 5. Mr. Fuller.

**575. Investments.** Security prices and yields; essential investment feature of various corporate securities—risk, income, control, etc.; methods of testing bonds and stocks; individual investment programs. Prerequisite: 262. Antecedents suggested: 374, 474. Fall, Winter. Rec. 3. Credit 3. Mr. Benedict.

**576. Investment Analysis.** Class and home practice in analyzing and evaluating the securities of twenty or more corporations; cyclical movements of security prices. Prerequisite: 575. Spring. Rec. 2. Credit 2. Mr. Benedict.

**580. Development of Social Thought.** Sociological thought and problems. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3. Mr. Von Tungeln.

**585. Rural Population.** Composition, characteristics, and movements of rural population as compared with urban. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3. Mr. Wakeley.

**586. Rural Leadership.** Specific problems of rural life; selection, development, tasks, obligations, and opportunities of rural leadership. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3. Mr. Wakeley.

**587. Rural Social Organization.** Place and function of farmer movements and organization in a changing rural order. Objectives and role of formal and informal organizations in neighborhood, community, and rural-urban groups. Prerequisite: 233, 386, or equivalent. Fall. Rec. 3. Credit 3. Mr. Wakeley.

**588. Social Legislation and Social Problems.** Analysis of existing, proposed and needed social legislation and study of the methods of attack on social problems. Prerequisite: 233, 386, or equivalent. Winter, Spring. Rec. 3. Credit 3. Mr. Von Tungeln.

**599. Special Topics.** Prerequisite: 233 or equivalent, and for Rural Sociology 386, Fall, Winter, Spring. Credit 1 to 5.

A. Agricultural Economics. Messrs. Allbaugh, Hopkins, Murray, Robotka, Quintus, Schickele, Schultz, Shepherd, Wilcox.

B. Consumption Economics. Miss Hoyt, Miss Reid.

C. Industrial Economics. Messrs. Benedict, Fuller, Wright.

D. Rural Sociology. Messrs. Anderson, Von Tungeln, Wakeley.

**604. Money and Banking.** Advanced monetary and banking theory; the foreign exchanges; central banking; the gold standard. Prerequisite: 504. Spring. Credit 3. Mr. Wright.

**605, 606. History of Economic Doctrines.** Fall, Winter. Lect. and rec. 3. Credit 3. Mr. Wright.

**614, 615. Advanced Economic Theory.** (614) Critical examination of neo-classical theories of price, distribution and production; recent developments in economic theory; relation of economic theory to practice. Fall. (615) Theory of imperfect competition; introduction to institutional and historical economics and to statistical economics. Winter. Credit 3 each course. Mr. Stigler.

**631, 632, 633. Agricultural Marketing.** Fall, Winter, Spring, respectively. Credit 3 each course. Mr. Robotka, Mr. Shepherd.

**634. Land Valuation.** Spring. Credit 3. Mr. Murray.

**641, 642, 643. Economics of Production.** Including farm accounting and land economics. Fall, Winter, Spring, respectively. Credit 3 each course. Messrs. Schultz, Schickele.

**650. Seminar.** Staff and graduate student conferences. May be taken for not to exceed three hours' credit in any quarter. Mr. Schultz.

## 699. Research.

- A. Farm Management and Organization. Messrs. Hopkins, Murray.
- B. Farm Finance. Mr. Murray.
- C. Foreign Trade. Mr. Schultz.
- D. Land Economics. Mr. Schickele, Mr. Schultz.
- E. Marketing. Messrs. Fuller, Robotka, Shepherd, Miss Reid.
- F. Price Analysis. Mr. Hopkins, Mr. Shepherd.
- G. Consumption Economics. Miss Hoyt, Miss Reid.
- H. Industrial Production. Mr. Fuller.
- I. Industrial and Public Finance. Mr. Benedict, Mr. Wright.
- J. Rural Sociology. Messrs. Anderson, Wakeley, Von Tungeln.

## ELECTRICAL ENGINEERING

M. S. COOVER, Head of Department

Professor Fish; Associate Professors Calvert, McClain; Assistant Professors Anderson, Brown, Hessler, Willis; Instructor Boast; Graduate Assistants Houghton, Plummer

*For information concerning the Division of Engineering, see page 125.*

The field of electrical engineering offers real opportunities to young men with trained intelligence. Business and industry are always in need of those who have had the advantage of an education that develops skillful thinking, analytical ability and sound judgment based upon a knowledge of fundamental principles. It is a significant fact that sooner or later approximately seventy percent of engineering graduates find themselves in positions of executive responsibility.

Electrical engineers engage in the management and operation of electrical manufacturing industries, electric power utilities, communication systems, steel mills, railroads, and industrial plants in general. Others establish themselves as research engineers, consulting engineers and valuation engineers. The curriculum in electrical engineering has been designed to enable the individual to enter any of these fields according to his incentive, initiative, and talents.

The first year presents splendid foundation material in chemistry, mathematics, English, drawing, and engineering application problems.

The second year introduces the student to the fundamental laws of the electric and magnetic circuit, which to him is his first real contact with the language of electrical engineering. A good balance is maintained between the electrical courses and those other subjects so necessary to provide adequate training.

The third and the fourth years give the student increasingly more electrical engineering studies both in the classroom and in the laboratories, and at the same time permit considerable freedom for the choice of elective courses. These elective courses may be technical or non-technical in nature, but care should be exercised in choosing them in conference with the counselor to whom the student has been assigned.

The electrical engineering laboratories are classified according to their utilization as introductory, general, transformer, communication, standardization, high voltage, and research laboratories. The equipment in each of these is adequate and modern.

Students appointed to the Reserve Officers' Training Corps will fill three hours elective each quarter with courses in Military Science, except as follows:

In the fall quarter, Junior year, Mil. Sci., credit 3, will be taken in place of Accounting, Ec. 374, credit 4, and the student will provide an elective for the extra 1 hr. credit. In the winter quarter, Junior year, Mil. Sci. will replace Govt. 315. In the fall quarter Senior year, Mil. Sci. will replace Scientific Papers, Engl. 414.

### Curriculum In Electrical Engineering

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

For professional degree, see page 144.

#### FRESHMAN YEAR

Fall Quarter	Credits <sup>2</sup>	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		Plane Analytic Geometry	
Math. 101	5	Math. 102C	4	Math. 103	5
Drawing and Projection		Theory of Project. Draw.		Working Drawings	
Engr.Dr. 131	2	Engr.Dr. 132	3	Engr.Dr. 133	3
Engineering Problems		Engineering Problems		Military 103 or 123	1
Gen.E. 104	1	Gen.E. 105	1		
Military 101 or 121	1	Military 102 or 122	1		
	<u>16</u>		<u>16</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., E.E. 100 (Spring).

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

#### SOPHOMORE YEAR

D.C. Circuits and Mach.		D.C. Circuits and Mach.		Electrical Laboratory	
E.E. 225	4	E.E. 226	4	E.E. 233	2
Electrical Laboratory		Electrical Laboratory		Extempore Speaking	
E.E. 231	1	E.E. 232	1	P.S. 311	3
Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Mechanics and Heat		Elec. and Magnetism		Light and Sound	
Phys. 221	5	Phys. 222	5	Phys. 223	5
Engineering Economics		Metal Shop		Properties of Materials	
Ec. 261	3	M.E. 233	3	T.&A.M. 334	2
				Engineering Problems	
				Gen.E. 206	1
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	<u>18</u>		<u>18</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
A.C. Circuits		A.C. Circuits		A.C. Machines	
E.E. 331	5	E.E. 332	4	E.E. 333	4
Electrical Laboratory		Electrical Laboratory		Electrical Laboratory	
E.E. 351	1	E.E. 352	1	E.E. 353	1
Physical Measurements		Physical Measurements		Physical Measurements	
Phys. 311	1	Phys. 312	1	Phys. 313	1
Statics of Engineering		Mechanics of Materials		Dynamics of Engineering	
T.&A.M. 274	3	T.&A.M. 324	5	T.&A.M. 344	4
†Accounting		Materials Laboratory		Thermodynamics	
Ec. 374	4	T.&A.M. 327	1	M.E. 344	5
Differential Equations		Metallurgy		Electives	3
Math. 316	4	M.E. 239	3		
		†American Government			
		Govt. 315	3		
	18		18		18

## SENIOR YEAR

A.C. Machines		A.C. Machines		Industrial Elec. Engr.	
E.E. 431	4	E.E. 432	3	E.E. 433	3
Electrical Laboratory		Electrical Laboratory		Electrical Laboratory	
E.E. 451	2	E.E. 452	2	E.E. 453	2
Communication Engineering		Transmission Engineering		Engineering Valuation	
E.E. 421	3	E.E. 465	4	Engr. 407	3
†Scientific Papers		Engineering Contracts		Illumination Engineering	
Engr. 414	3	Engr. 405	3	E.E. 485	3
Power Plant Engineering		Electronics		Electives	7
M.E. 466	6	E.E. 474	3		
	18	*Electives	3		
			18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, E.E. 471, 472, 473; Inspection Trip, E.E. 400 (Fall).

†Not required of students appointed to the Reserve Officers' Training Corps. In replacing Accounting, Ec. 374, credit 4, with Military Science and Tactics, credit 3, students will have to provide an elective for the extra 1 hr. credit.

\*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year. See paragraph on electives, page 230.

Any one of the sequences listed below may be elected in the Senior year:

Communication Engineering	Communication Engineering	Communication Engineering
E.E. 421	E.E. 422	E.E. 423
Communication Engineering	Electronics	Industrial Electronics
E.E. 421	E.E. 474	E.E. 475
Communication Engineering	Electronics	Radio Engineering
E.E. 421	E.E. 474	E.E. 477
Communication Engineering	Electronics	Television Engineering
E.E. 421	E.E. 474	E.E. 478
	Transmission Engineering	Transmission Engineering
	E.E. 465	E.E. 466

## Description of Courses

100. **Technical Lectures.** Current electrical engineering thought and practices presented by staff members and visiting lecturers. Spring. Lect. 1. Required.

225, 226. **Direct Current Circuits and Machines.** The laws of electric and magnetic circuits. Principles of design, construction, and operation of direct current machines. Prerequisite: Math. 102 and credit or classification in Phys. 221. Fall, Winter, Rec. 4. Credit 4.

231, 232, 233. **Electrical Laboratory.** (231) Must be accompanied by 225. (232) Must be accompanied by 226. Prerequisite: 231. Fall, Winter, respectively. Lab. 1, 3 hr. Credit 1 each course. (233) Continuation of 232. Spring. Lab. 2, 3 hr. Credit 2.

331. **Alternating Current Circuits.** Mathematical representation of electric circuits, transient and steady-state solutions, vector and symbolic methods, wave analysis and superposition. Prerequisite: 226. Must be accompanied by Math. 316 or equivalent. Fall. Rec. 5. Credit 5.



332. **Alternating Current Circuits.** Voltage, current and power relations in poly-phase circuits, symmetrical components. Prerequisite: 331. Winter. Rec. 4. Credit 4.
333. **Alternating Current Machines.** Principles of design, construction, and operation of alternating current machines. Prerequisite: 332. Spring. Rec. 4. Credit 4.
- 338, 339, 340, 348, 349, and 350 are courses designed especially for General Engineers and for Mechanical Engineers.
338. **Direct Current Machines.** Fundamental laws of electric and magnetic circuits. General principles of construction and operation of direct current machines. Prerequisite: Phys. 222, Math. 212, and classification in E. E. 348. Fall. Rec. 3. Credit 3.
339. **Alternating Current Circuits and Machines.** Principles of alternating current circuits and machines. Must be accompanied by 349. Prerequisite: 338. Winter. Rec. 3. Credit 3.
340. **Alternating Current Machines.** Continuation of 339. Must be accompanied by 350. Spring. Rec. 3. Credit 3.
348. **Electrical Laboratory.** To accompany 338. Fall. Lab. 1, 3 hr. Credit 1.
349. **Electrical Laboratory.** To accompany 339. Winter. Lab. 1, 3 hr. Credit 1.
350. **Electrical Laboratory.** To accompany 340. Prerequisite: 349. Spring. Lab. 1, 3 hr. Credit 1.
- 351, 352, 353. **Electrical Laboratory.** (351) Continuation of 233. Must be accompanied by 331. (352) (353) Continuation of 351. Fall, Winter, Spring, respectively. Lab. 1, 3 hr. Credit 1 each course.
355. **Electrical Applications in Buildings.** Circuit arrangements in modern buildings and characteristics of the electrical equipment with special consideration of the application of electric lighting. Prerequisite: Arch. E. 383. Alternate years. Offered Fall, 1937. Rec. 3. Credit 3.
356. **Electrical Equipment.** A short course offered to those engineering students who are not specializing in electrical, mechanical, chemical, or general engineering. It comprises the fundamental principles of direct and alternating circuits and machines. Prerequisite; Junior classification. Winter. Rec. 5. Credit 5.
400. **Senior Inspection Trip.** One week spent in Chicago and other industrial centers. Prerequisite: Senior E. E. classification. Fall. Required.
- 421, 422, 423. **Communication Engineering.** (421) Fundamental principles of communication circuits. Prerequisite: 332. Fall. Rec. 3. Credit 3. (422) (423) Long lines in steady state, equivalent networks, loading, filters, and corrective networks. (422) Prerequisite: 421. (423) Prerequisite: 422. Winter, Spring, respectively. Rec. 3. Lab. 1, 3 hr. Credit 4 each course.
431. **Alternating Current Machines.** Continuation of 333. Fall. Rec. 4. Credit 4.
432. **Alternating Current Machines.** Continuation of 431. Winter. Rec. 3. Credit 3.
433. **Industrial Electrical Engineering.** A survey of new developments in electrical equipment and in electrical engineering practice. Prerequisite: 432. Spring. Rec. 3. Credit 3.
- 435, 436, 437, and 438 are courses designed especially for Chemical Engineers.
435. **Direct Current Circuits and Machines.** Prerequisite: Phys. 222, and Math. 211. Fall. Rec. 3. Credit 3.
436. **Electrical Laboratory.** Must be accompanied by 435. Fall. Lab. 1, 3 hr. one week; report writing, 3 hrs. following week. Credit 1.
437. **Alternating Current Circuits and Machines.** Prerequisite: 435. Winter. Rec. 3. Credit 3.
438. **Electrical Laboratory.** Prerequisite: 436. Must be accompanied by 437. Winter. Lab. 1, 3 hr. one week; report writing, 3 hrs. following week. Credit 1.
- 451, 452, 453. **Electrical Laboratory.** (451) Continuation of 353. Must be accompanied by 431. (452) (453) Continuation of 451. Fall, Winter, Spring, respectively. Lab. 2, 3 hr. Credit 2 each course.
- 465, 466. **Transmission Engineering.** Principles of design, construction, and operation of transmission and distribution systems. (465) Prerequisite: 431. (466) Prerequisite: 465. Winter, Spring, respectively. Rec. 4. Credit 4 each course.
- 471, 472, 473. **Seminar.** Preparation, presentation, and discussion of papers on selected or assigned topics in electrical engineering. Prerequisite: Classification in senior electrical engineering curriculum. Fall, Winter, Spring, respectively. Rec. 1. Required.
474. **Electronics.** Characteristics and applications of electronic devices, solution of networks containing such elements. Prerequisite: 421. Winter. Rec. 3. Credit 3.

- 475. Industrial Electronics.** Continuation of 474, mainly in the fields of control and power applications. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.
- 476. Electric Railways.** Electric railway systems and apparatus, design of feeder and trolley systems, and determination of proper equipment for specified service. Prerequisite: 432. Spring. Lect. and rec. 3. Credit 3.
- 477. Radio Engineering.** Fundamental principles of radio, and their engineering applications. Prerequisite: 421, 474. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.
- 478. Television Engineering.** Consideration of general problems, electronic translation devices, control of electron beams, high-frequency circuits, ultra-short wave propagation. Prerequisite: 421, 474. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.
- 485. Illumination Engineering.** The science of illumination from the viewpoint of its engineering utilization. Prerequisite: 332. Spring. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.
- 494. Transient Phenomena.** Development of expressions for circuit and machine transients with oscillograph demonstrations. Prerequisite: 432 or equivalent. Spring. Rec. 3. Credit 3.
- 498. Thesis.** Students especially qualified and desiring to do so may prepare and submit a thesis. This will consist of an original investigation and a complete report. The subject must be approved by the head of the department, but wide latitude will be given in the choice. Prerequisite: senior classification. Credit 3 to 5.
- 595. Special Topics.** Formulation and solution of theoretical or practical problems connected with electrical circuits, apparatus, machines, or systems. Fall, Winter, Spring. Credit 2 to 5 each time elected. Messrs. Anderson, Boast, Brown, Calvert, Coover, Fish, Hessler.
- 600. Seminar.** Fall, Winter. Credit 2 or 3. Mr. Hessler.
- 614. Electrical Properties of Solid, Liquid, and Gaseous Dielectrics.** Theory of dielectrics, potential gradient and breakdown potentials, ionization, and corona losses. Fall, Spring. Lect., rec., and lab. Credit 3 to 5 each time elected. Mr. Brown.
- 626. Transmission and Distribution Engineering.** Design of electric transmission, substation, and distribution systems. Prerequisite: 465. Spring. Lect., rec. and design periods. Credit 3 to 5. Mr. Coover.
- 628. Power System Stability.** Three and four-circuit transformers, solution of unbalanced circuits by the method of symmetrical components, use of charts representing transmission lines and synchronous machines in the electrical steady state for the determination of system stability limits. Prerequisite: 432, 465, Math. 316, or equivalent. Spring. Lect., rec., and lab. Credit 3 to 5. Mr. Calvert.
- 634. Circuit Analysis by Operational Methods.** Fundamental means of solving circuit problems, including the classic method, the superposition theorem, the Heaviside expansion theorem, the Heaviside operational calculus, and the Fourier integral. Prerequisite: 432 or equivalent and Math. 316 or equivalent. Fall. Credit 3 to 5. Mr. Anderson.
- 637. Transmission-Line Transients.** Traveling waves on single-circuit lines including a study of attenuation, distortion, and reflection; oscillations in transformer windings; outline of methods for multi-circuit lines. Prerequisite: 634. Winter, Spring. Lect., rec., and lab. Credit 3 to 5. Mr. Anderson.
- 647. Communication Networks.** Analysis and design of networks in the field of communication engineering. Prerequisite: 423. Rec. 3. Lab. 1, 3 hr. Credit 4. Mr. Anderson.
- 650. Alternating Current Machines.** An extended mathematical study of the theory of alternating current machinery and of the application of the theory to practical performance. Prerequisite: 432 or equivalent. Fall. Credit 3 to 5. Mr. Calvert.
- 660. Transient Analysis.** Transient effects in the operation of electric machines and systems. Prerequisite: 634, 650. Winter. Lect., rec., and lab. Credit 3 to 5. Mr. Brown.
- 680. Technical Problems.** Graphical, numerical, and analytical methods of solving differential equations applied to problems representative of those likely to be met by a consulting engineer. Fall, Winter, Spring. Credit 3 to 5 each time elected. Mr. Calvert.
- 690. Research.** Messrs. Anderson, Brown, Calvert, Coover, Fish, Hessler.

## ENGINEERING

ANSON MARSTON, Head of Department

*For information concerning the Division of Engineering, see page 125.*

A certain number of general courses, listed below, are given by the Dean of the Engineering Division and by other members of the engineering faculty for the service of the entire division.

A certain amount of Engineering Economics is required in each of the several engineering curricula, and in addition, engineering students who desire can elect more advanced work from the Engineering Economics courses listed below.

For the student who desires a full four-year curriculum which combines the fundamental principles of engineering with the principles of business administration, see page 245 for the outlined curriculum in General Engineering.

In each of the curricula in engineering there is provision for elective subjects during the junior and senior years. It is recommended that part of the electives be selected with a view to broadening the knowledge in some field other than those directly related to engineering.

### Description of Courses

**114. Orientation.** The nature of professional work in engineering. Methods of testing the individual's aptitudes for the engineering profession. Fall. Lect. 1. Required.

**115. Orientation.** The nature of the various branches of engineering and some fundamental considerations in selecting a career. Winter. Lect. 1. Required.

**354. Employment Methods and Employee Development.** Principles and technique of employment methods and their relation to industrial development. Prerequisite: senior college classification. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

**405. Engineering Contracts.** The engineer in business; contract essentials and principles; agent and independent contractor; contracts involving real and personal property, sale and transportation; corporation engineering; legal and equitable jurisprudence. Prerequisite: senior college or graduate college classification. Fall, Winter, Spring. Rec. 3. Credit 3.

**406. Alignment Charts for Engineering Formulae.** Construction of conversion scales, alignment charts and similar devices or solving various engineering equations. Prerequisite: Math. 213. Alternate years. Offered Spring, 1938. Rec. 1. Lab. 1, 3 hr. Credit 2.

**407. Engineering Valuation.** The principles of valuation work by engineering experts. Prerequisite: senior college or graduate college classification. Fall, Winter, Spring. Rec. 3. Credit 3.

**416. Graphical Analysis of Engineering Problems.** Studies of graphical methods of solving various experimental problems arising in engineering practice. Prerequisite: Math. 213. Alternate years. Offered Spring, 1939. Rec. 2. Lab. 1, 3 hr. Credit 3.

**417. Engineering Valuation.** The application of the principles of engineering valuation including field work; collection and use of mortality data; study of court practices regarding the valuation of utilities. Prerequisite: 407. Fall, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

**425. Principles of Personnel Supervision.** Discussion of a series of cases of the general variety of human contacts which arise in the course of employment, with the desirable methods to meet such conditions when they occur. Prerequisite: Senior classification. Winter, Spring. Rec. 3. Credit 3.

**604. Engineering Valuation Research.** Mr. Marston.

**605. Engineering Law.** Engineering relations; professional ethics; evidence; expert witness; contract letting, advertisement, instruction, proposal, contract forms; workmen's compensation, and employer's liability laws; mechanic's and material man's liens. Prerequisite: 405. Fall, Winter, Spring. Rec. 3 to 5. Credit 3 to 5. Mr. Mecker.

**606. Engineering Education Research.** Mr. Marston.

### ENGINEERING ECONOMICS

**261, 262, 263. Principles and Problems of Economics.** Not open to freshmen (261) Fall, Winter, Spring. (262) Winter, Spring. (263) Spring. Rec. 3. Credit 3 each course.

**365. Business Law.** Fundamental principles of law as applied to business transaction. Fall, Winter, Spring. Rec. 3. Credit 3.

**366. Advanced Business Law.** Continuation of 365. Emphasis on credit transaction, employment relations, non-contractual rights and liabilities. Prerequisite: 365. Winter. Rec. 3. Credit 3.

**370. Elementary Accounting.** Fundamental accounting principles common to all business enterprises. Winter, Spring. Rec. 2. Lab. 1 or 2, 3 hr. Credit 3 or 4.

**374. Accounting.** Preparation and analysis of balance sheet and profit and loss statement. Double entry bookkeeping, significance of assets, liabilities, expenses, and incomes. Prerequisite: 261 or equivalent and senior college classification. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

**375. Advanced Accounting.** Analysis of financial statements, applications of accounting methods as an instrument of business control. Prerequisite: 370 or 374. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

**376. Cost Accounting.** Methods of determining and analyzing costs of materials; processes of labor and machines; distribution of direct and overhead costs; preparation of cost reports. Prerequisite: 370 or 374. Fall, Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

**406. Industrial Relations.** Relations of employer and employee under present conditions of industry. Matters of public policy such as labor legislation and social insurance. Prerequisite: 202 or equivalent. Spring. Rec. 3. Credit 3.

**474. Corporation Finance.** Principles of financial organization and management. Types of corporate securities, financing of new corporations and their later management, and reorganizations. Prerequisite: 261 or equivalent. Antecedents suggested: 262, 374. Fall, Spring. Rec. 3. Credit 3.

**499C. Special Problems in Industrial Economics.** Prerequisite: 203 or equivalent. As arranged. Fall, Winter, Spring. Credit 1 to 5.

**560. Economics of Public Utilities.** To acquaint the student with the development, economic characteristics, and management of public utilities. Prerequisite: 203 or equivalent, 374. Spring. Rec. 3. Credit 3. Mr. Fuller.

**564. Corporate Organization.** Organization and control of corporations and other forms of business. Procedure of incorporation, relationships of the parties in the corporation, and combinations of corporations in large industries and utilities. Prerequisite: 261 or equivalent, 365, 374. Spring. Rec. 3. Credit 3. Mr. Schramper.

**568. Industrial Marketing.** From the standpoint of the manufacturer. Merchandising channels, sales organization, sales engineering, and co-ordination of sales and production. Prerequisite: 263, 374. Winter. Rec. 3 or 5. Credit 3 or 5. Mr. Fuller.

**575. Investments.** Security prices and yields; essential investment features of various corporate securities—risk, income, control, etc.; method of testing bonds and stocks; individual investment programs. Prerequisite: 262. Antecedents suggested: 374, 474. Fall, Winter. Rec. 3. Credit 3. Mr. Benedict.

**576. Investment Analysis.** Class and home practice in analyzing and evaluating the securities of twenty or more corporations; cyclical movements of security prices. Prerequisite: 575. Spring. Rec. 2. Credit 2. Mr. Benedict.

**599C. Special Topics in Industrial Economics.** Messrs. Benedict, Fuller, Wright.

**699. Research.**

**E. Marketing.** Messrs. Fuller, Robotka, Shepherd, Miss Reid.

**H. Industrial Production.** Mr. Fuller.

**I. Industrial and Public Finance.** Mr. Benedict, Mr. Wright.

## ENGINEERING DRAWING

O. A. OLSON, Head of Department

Assistant Professors Miller, Pratt; Instructors Berkel, Countryman, Stevens.

*For information concerning the Division of Engineering, see page 125.*

Drawing is one of the oldest of all languages. In the Louvre, Paris, a statue of Gudea, the engineer-ruler, bears a description and drawing of a temple that was constructed about 2600 B. C. In spite of its early use among many nations, drawing is not a "dead" language. Refinement in its international use is a daily study among teachers, draftsmen, engineers, and authors of engineering books.

In the present industrial age, nearly all readers of papers, magazines, and scientific reports are compelled to interpret drawings as a part of the composition. Due to this fact, it would be an aid to all classes of people to have a reading knowledge of the engineer's language.

Engineering Drawing is a graphical means of conveying and recording directions for the construction of material objects in such a way that the information is definite, accurate, and readily understood by those who use it.

As an educational subject, the study of Engineering Drawing develops accurate thinking, strengthens the faculties of visualization, and develops neatness and legibility in graphical expression. The student is given a vehicle of expressing new ideas or inventions without excessive cost. For the freshman, few other courses require as much independent thought and action.

Engineers do not think of Engineering Drawing as a profession. Nevertheless, many find it a gateway through which they pass in entering the engineer's field.

The Department of Engineering Drawing is a service department. Freshmen from all the engineering departments have a common course under teachers selected from the various departments.

It is the policy of the Department of Engineering Drawing to teach the fundamentals of the "grammar" of Engineering Drawing. Emphasis is placed on straight thinking, visualization, accuracy, neatness, and speed in workmanship; development of theoretical knowledge, and the making of complete working drawings such as are used in commercial work.

### Description of Courses

131. **Drawing and Projection.** Use of instruments, lettering, orthographic and isometric projections, curves, charts, and graphs. Fall, Winter, Spring. Lab. 2, 3 hr. Credit 2.

132. **Theory of Projective Drawing (Descriptive Geometry).** Practical applications. Prerequisite: 131. Fall, Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

133. **Working Drawings.** Technical sketching, dimensioning, standards and conventions, detail and assembly drawings of machines, structures, and conduits. Prerequisite: 132. Fall, Winter, Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3.

## ENGLISH

J. R. DERBY, Head of Department

Professors Jones, Raymond; Associate Professors Cooper, Hogrefe, Lang, Lorch, Starbuck, Tompkins, Wendell; Assistant Professors Dudley, Fuller; Instructors Fleming, Foladare, Hawse, Kirkman, Mathis, Mills, Shultz, Walker.

*For information concerning the Division of Industrial Science, see page 131.*

The Department of English undertakes to provide for technical students courses in both composition and literature.

Required Freshman Composition, with constant practice in writing, includes a review of fundamental grammar and sentence structure, the student's analysis and consequent improvement of his own style, and a brief introduction to the ideas of Greek, Hebrew, and English literature. Through composition a student has the opportunity to understand himself and his environment, to organize expository and informational papers, to think critically of reading and writing as parts of the same process, and to interpret human values through his own experience.

Ambitious students who wish to maintain skill, to rise above mere accuracy, and to gain power and individuality of expression, elect further courses in writing, choosing 204, 205, 304-305, or 404.

In literature the student is offered a carefully selected list of courses with emphasis on ideas and on appreciation. Through a liberal approach to ideas he has a chance to form reading habits, to develop independence and originality in thinking, to realize social obligations, and to appreciate such non-material values as beauty and truth—in brief, to develop a culture which is a vital part of well-balanced living. He may choose such basic courses as 254, 255, if they are elective in his curriculum; he may add 354, 355, 364, 374, 384, 454, 455, 456, 464, 466, 467.

## Description of Courses\*

101, 102, 103. **Freshman Composition.** (101) Fundamental principles. Sentence, paragraph, short papers, précis-writing. (102) Exposition. Short and long papers. (103) Literary types related to composition. Short and long papers. Fall, Winter, Spring. Rec. 3. Credit 3 each course.

104. **Composition.** For students who come from other colleges and bring partial credit in required composition, or who for other reasons need to supplement this requirement. Winter, Spring. Rec. 2. Credit 2.

204. **Expository Writing.** Reading of essays and a current periodical as a basis for discussion and writing. Prerequisite: 103, Lib. 106. Fall, Winter, Spring. Rec. 2. Credit 2.

285. **Reasoning and Writing.** Basic principles. Gathering and evaluating evidence; reasoning; detecting fallacies; analyzing persuasive elements in magazine articles, editorials, advertisements, etc. Short and long papers. Prerequisite: 103, Lib. 106. Fall, Winter, Spring. Rec. 3. Credit 3.

254, 255. **Nineteenth Century.** British masterpieces of the nineteenth century and their relation to scientific thought and to the tendencies of the present day. Prerequisite: 103. (254) 1798 to 1832. Fall, Winter, Spring. (255) 1832 to 1890. Winter, Spring. Rec. 3. Credit 3 each course.

\*For description of vocational courses, see page 347.

304, 305. **Advanced Composition.** For students who already write with some skill. Prerequisite: 103. (304) Writing adapted to the needs and interests of the individual student. (305) Stress upon a single type of writing selected by the individual student. Fall, Winter, Spring. Rec. 3. Credit 3 each course.

354, 355. **World Literature.** Prerequisite: 103. (354) Representative masterpieces of Greek, Roman, Italian, German, and Russian literatures. Spring. (355) Survey of man's attitude toward nature. Winter. Rec. 3. Credit 3 each course.

364. **American Masterpieces.** Reading course in nineteenth-century American poetry and prose, with particular attention to the recognized masterpieces. Prerequisite: 103. Winter, Spring. Rec. 3. Credit 3.

374. **British Masterpieces.** Prior to 1775. Significant works of the great English writers prior to the Romantic era. Prerequisite: 103. Spring. Rec. 3. Credit 3.

384. **Contemporary Literature.** Points of view expressed in various types. Prerequisite: 254 or 255. Spring. Rec. 3. Credit 3.

394. **The Teaching of English.** (Voc. Ed. 394.) For students preparing to teach English in addition to other subjects. The teaching of literature and composition. Prerequisite: a quality-point average of 2.5 in twelve hours, including 205 or 304 and nine hours selected from 254, 255, 364, 374, 454, 464. Spring. Rec. 3. Credit 3.

404. **Business Correspondence.** Open to senior-college students only. Principles which govern the writing of business letters. Types of business letters. Winter, Spring. Rec. 2. Credit 2.

414. **Writing of Scientific Papers.** For juniors and seniors in any technical department wishing to co-operate. Projects in technical exposition. Required and collateral readings. Prerequisite: 103. Fall, Winter, Spring. Rec. 3. Credit 3.

454, 455, 456. **Fiction.** Prerequisite: 103. (454) The short story. Its growth as a distinct literary type with emphasis upon the modern period. Not offered in 1937-'38. (455) Representative novels by Jane Austen, Scott, Dickens, Thackeray, and George Eliot. Not offered in 1937-'38. Winter. (456) Representative novels by Meredith, Hardy, Henry James, Conrad, and Galsworthy. Winter. Rec. 3. Credit 3 each course.

464, 466, 467. **Drama.** Prerequisite: 103. (464) Shakespeare. Rapid reading of histories, comedies, and tragedies for intelligent appreciation. Fall, Spring. (466) Types of Drama. Representative plays illustrating the development of the stage from classical to modern times; appreciation of the drama as a literary type. Not offered in 1937-'38. Winter. (467) Modern Drama. Study of innovations in technique and theme. Winter. Rec. 3. Credit 3 each course.

## FARM CROPS

(Sub-Department of Agronomy)

For description of courses, see page 179.

## FLORICULTURE

See page 277.

## FORESTRY

(Administered in the department of Horticulture and Forestry. See page 275)

B. S. PICKET, Head of Department

PROFESSOR G. B. MACDONALD

Associate Professors Genaux, Thomson; Assistant Professors Hartman, Larsen; Instructors Julander, McComb; Fellow Felker; Extension Worker Ramsey

*For information concerning the Division of Agriculture, see page 120.*

The Forestry Department offers four and five-year curricula designed to fit the student for professional forestry work. The degree Bachelor of

Science is given upon the completion of the four-year curriculum. An additional year's work is offered for those who desire more specialization.

The five year curriculum is designed to give thorough preparation in the fundamental subjects and in addition to provide opportunity during the last three years for considerable specialization in one of four distinct groups representing fields in which foresters are being employed:

- (A) Forestry and Conservation Group leading to National and State forest administration, soil conservation work and positions with lumber companies and other forest using industries.
- (B) Forestry and Economics Group leading to federal, state and private activities in the economic fields related to forestry.
- (C) Forestry and National Forest Range Management leading to specialized work in grazing activities on State and National forests and on the public domain.
- (D) Forestry and Wild Life Management Group offers sufficient specialization to provide for proper administration of wild life activities in connection with the handling of National, State or private forest areas or lands of the Biological Survey, Indian Service or other agencies.

During the past few years forestry work in its various phases has been greatly stimulated through such agencies as the C. C. C. organization, the Soil Conservation Service, the U. S. Forest Service, Resettlement Division, and others. Private and corporate wood using industries are becoming more active and are employing trained foresters.

The forestry students are required to complete the ten weeks summer camp which is usually located on a National forest in the Lake States, Rocky Mountains, or on the West Coast. The work involves practice in field operations such as timber surveys and mapping; studies of tree species and forest types; administration of the forest, range, wild life, and recreational areas; studies of logging and sawmill operations as well as developments in fire protection, insect, and tree disease control.

**ENROLLMENT.** The present facilities of the college make it necessary to limit the second year or sophomore enrollment in forestry to seventy-five students. If more than this number apply for second year enrollment selection will be made on a basis of scholarship, personality, state residence, etc.

### Curriculum in Forestry

Leading to the degree of Bachelor of Science upon satisfactory completion of four years work including Summer Camp of ten weeks. Also the degree of Bachelor of Science with major in Forestry and Conservation; Forestry and Economics; Forestry and National Forest Range Management; or Forestry and Wildlife Management on completion of a fifth year of work selected in consultation with the forestry staff and approved by the Dean of the Division.

Forestry students are required to complete three months of practical forestry work before graduation in addition to the summer camp.

For entrance requirements, see page 99.



## FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Forestry		General Forestry		General Forestry	
For. 101 <sup>1</sup>	3	For. 102	3	For. 103	3
General Botany		General Botany		Systematic Botany	
Bot. 101	3	Bot. 102	3	Bot. 206	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		Surveying	
Math. 101	5	Math. 102A	5	C.E. 116	3
				Agricultural Geology	
				Geol. 875	3
Military 121	1	Military 122	1	Military 123	1
	<u>15</u>		<u>15</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Seminar, For. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104 (three months of which are to be forestry summer camp), see page 177.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SUMMER CAMP

The following courses of study are carried on in the summer camp for forestry students. The camp curriculum occupies ten weeks during the summer between the Freshman and Sophomore years. Summer camp is prerequisite for entrance to the Junior year.

Silviculture	
For. 214	5
Lumbering	
For. 234	4
National Forest Operations	
For. 250	4
Mensuration	
For. 244	5
	<u>18</u>

## SOPHOMORE YEAR

Lumbering		Forest Mensuration		Forest Mensuration	
For. 224	5	For. 241	4	For. 242	2
Forest Mapping		Animal Biology		Forest Planting	
For. 245	3	Zool. 114	3	For. 206	5
Dendrology		Dendrology		Organic Chemistry	
Bot. 256	4	Bot. 257	3	Chem. 257	4
General Chemistry		General Chemistry		Animal Biology	
Chem. 101	4	Chem. 102	4	Zool. 115	3
		Physics		Soils	
		Phys. 204	3	Soils 254	3
Military 221	1	Military 222	1	Military 223	1
	<u>17</u>		<u>18</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; and For. 211, 212, 213.

## JUNIOR YEAR

Plant Physiology		Silviculture		Silviculture	
Bot. 205	4	For. 801	3	For. 802	3
General Ecology		Surveying		Forest Adm. & Protection	
Bot. 424	3	C.E. 812	4	For. 897	3
Game Animals		Forest Soils		Surveying	
Zool. 504	3	Soils 374	3	C.E. 313	3
Surveying				American Government	
C.E. 311	4			Govt. 315	3
Gen. Agr. Economics				Fishes	
Ec. 231	3			Zool. 506	3
		Group Electives*	6 or 7	Group Electives	2 or 3
	<u>17</u>		<u>16 or 17</u>		<u>17 or 18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, For. 311, 312, 313.

\*For Group Electives, see page 242.

Chem. 259; For. 385, 436, 470, 494 and P.S. 311 are required in all groups.

For. 343, 388, 487 are required in all groups except in National Forest Range Management Group.

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Silviculture For. 803	3	History and Policy For. 399	4	Forest Finance For. 396	4
Forest Insects Zool. 377	3				
Technical Journalism T.Jl. 225	3				
Seminar For. 411	R	Seminar For. 412	R	Seminar For. 418	R
Group Electives*	8 or 9	Group Electives*	13 or 14	Group Electives*	13 or 14
	17 or 18		17 or 18		17 or 18

## FIFTH YEAR

Group Electives*	16 to 18	Group Electives*	16 to 18	Group Electives*	16 to 18
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\*See Group Electives below.

## Group Electives

Students who are specializing in any one of the following fields should consult with their counselors at the time group electives are to be taken.

- A. Forestry and Conservation Group.
- B. Forestry and Economics Group.
- C. Forestry and National Forest Range Management Group.
- D. Forestry and Wildlife Management Group.

The letters following the subjects listed below refer to the particular group, or groups, in which the respective subjects are elective.

Subject	Cr.	Elect.- Groups	Subject	Cr.	Elect.- Groups
Livestock Problems, A.H. 101	(2)	C, D	National For. Rge. Mgt., For. 398	(3)	A, C, D
Livestock Problems, A.H. 102	(2)	C, D	Soil Erosion Control, For. 436	(3 to 10)	A, B, C, D
Animal Breeding, A.H. 350	(3)	D	Lumber Markets, For. 438	(4)	A, B
Drain. & Flood Control, A.E. 420	(3)	A	General Forest Economics, For. 470	(3)	A, B, C, D
Erosion Structures, A.E. 428	(3)	A	Forest Products, For. 487	(5)	A, B, D
General Bacteriology, Bact. 304C	(4)	A, C, D	Forest Mgt., For. 494	(4)	A, B, C, D
Forest Pathology, Bot. 416	(4)	A, B, C	For. Range Adm., For. 495	(3)	C
Weeds and Poison Plants, Bot. 455	(3)	C	National Forest Range Mgt. Plans, For. 496	(3)	C
Native Rge. Plts., Bot. 566	(3)	C	Adv. For. Planting, For. 506	(3)	A
Adv. Plant Ecol., Bot. 584	(3)	C	General Genetics, Gen. 300	(3)	C, D
Chem. For. Prod., Chem. 259	(2)	A, B, C, D	Ec. History of U. S., Hist. 324	(3)	B
Gen. Agr. Economics, Ec. 232	(8)	B	Rec. & Reg. Plan., L.A. 403	(3)	A, B
Gen. Agr. Economics, Ec. 233	(3)	B	Rec. Facilities, L.A. 404	(3)	D
Elem. Ec. Statistics, Ec. 234	(3)	B	Extemp. Speaking, P.S. 311	(3)	A, B, C, D
Money and Banking, Ec. 304	(3)	B	Gen. Psychology, Psych. 204	(3)	A
Land Economics, Ec. 334	(3)	B	Soil Mgt., Soils 454	(3)	A
Business Law, Ec. 365	(3)	B	Soil Conservation and Erosion Control, Soils 464	(3)	A, B
Elem. Accounting, Ec. 370	(3)	B	Feature Articles, T.Jl. 385	(3)	A, B, C
Adv. Accounting, Ec. 375	(3)	B	Bird Study, Zool. 315	(2)	D
Applied Sociology, Ec. 384	(3)	A, B	Tech. in Wild Life Mgt., Zool. 508	(3)	C, D
Value and Dist., Ec. 507	(3)	B	Parasites and Disease Carrying Insects, Zool. 514	(4)	C, D
Value and Dist., Ec. 508	(3)	B	Taxonomy & Ecology of Vertebrates, Zool. 519	(4)	D
Business Corres., Engl. 404	(2)	B	Game Mgt., Zool. 520	(3)	A, C, D
Scientific Writing, Engl. 414	(3)	D	Embryology, Zool. 534	(4)	D
Hay & Past. Crops, F.C. 404	(3)	C			
Forest Mensuration, For. 343	(3)	A, B, D			
Timber Preserv., For. 385	(3)	A, B, C, D			
Wood Tech., For. 388	(4)	A, B, D			

## Description of Courses

**100. Farm Forestry.** Identification and uses of trees and commercial woods; forest planting; woodlot management; shelterbelt installation and fence post treatment. Spring. Rec. 3. Credit 3.

**101, 102, 103. General Forestry.** A general survey of the field. (101) Fall. Lect. and rec. 2. Rec. and lab. 1, 3 hr. Credit 3. (102) Winter. Lect. 3. Credit 3. (103) Spring. Lab. 3, 3 hr. Credit 3.

**110. Forestry Seminar.** Current forestry topics. Spring. Lect. 1. Required.

**206. Forest Planting.** Collecting and storing tree seeds. Nursery practice, including seed bed methods, transplanting, and field planting. Spring. Lecture and rec. 2. Lab. 3, 3 hr. Credit 5.

**211, 212, 213. Forestry Seminar.** Current forestry topics. Required.

**214. Silviculture.** Field studies of forest stands; types, zonations and formations; harvesting and regenerating the mature crops, improving the young stands; forest ecology. Summer camp. Field work 5, 3 hr. Credit 5.

**224. Lumbering.** Detailed study of logging and milling operations. Fall. Rec. and lect. 5. Credit 5.

**234. Lumbering.** A detailed study of logging and milling operations in an important forest region. Summer forestry camp. Field work 4, 3 hr. periods. Credit 4.

**241, 242. Forest Mensuration.** (241) Measuring the forest and forest products including log scaling and timber estimating. Winter. Rec. and lect. 2. Lab. 2, 3 hr. Credit 4. (242) Continuation of 241, elementary consideration of forest growth. Spring. Rec. and lect. 1. Lab. 1, 3 hr. Credit 2.

**244. Forest Mensuration.** Field practice in scaling logs, estimating timber, and preparing various forest maps. Summer camp. Field work 5, 3 hr. periods. Credit 5.

**245. Forest Mapping.** Actual construction of topographic and type maps from field data. Prerequisite: 103. Fall. Lab. and field 3, 3 hr. Credit 3.

**250. National Forest Operations.** A study of the field activities on National Forests. Summer Forestry Camp. Credit 4.

**301, 302, 303. Silviculture.** (301) Factors determining form and growth of trees; distribution of forest types and formations; forest influences. Winter. Prerequisite: Bot. 424, credit or classification in Bot. 205. (302) Development of forest stands as to composition and age classes; application of scientific systems of harvesting and reproducing the forest crops; improvement of immature forests. Prerequisite: 301. Spring. (303) The practice of silviculture in the United States and abroad. Prerequisite: 302. Fall. Lect. and rec. 3. Credit 3 each course.

**311, 312, 313. Forestry Seminar.** Current Forestry topics. Required.

**343. Forest Mensuration.** Advanced forest measurements, the determination of standards for growth and yield measurement in forests. Fall. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

**385. Timber Preservation.** Seasoning and durability of woods. Kiln drying. Methods of preserving railroad ties, timbers, paving blocks, poles, and posts. Winter. Lectures 3. Credit 3.

**388. Wood Technology.** Structural, physical, and mechanical properties of commercial woods; their identification and chief uses. Winter. Rec. 1. Lab. 3, 3 hr. Credit 4.

**396. Forest Finance.** (Ec. 396.) Appraisal of forest land and stumpage. Determination of the profit of forests compared with other land uses. Land classification, forest taxation, and credit. Prerequisite: Ec. 231. Spring. Rec. 4. Credit 4.

**397. Forest Administration and Protection.** Organization of national forests. Construction of permanent improvements. Grazing, reforestation, timber sales, etc. Fire protection. Spring. Lect. and rec. 3. Credit 3.

**398. Forest Range Management.** History of the National Forest Range, types of forage, poisonous plant control; range regeneration, grazing, reconnaissance, grazing policies and range management plans. Fall. Lect. and rec. 3. Credit 3.

**399. History and Policy.** Development in the different countries from the earliest periods to the present. State and national law. Municipal forestry. Winter. Rec. 4. Credit 4.

**400. Forest Conservation.** The development of forest conservation, national, state, and private. The forest in relation to human needs. Forestry as related to other conservation work. Winter. Lect. and rec. 3. Credit 3. (For Non-Forestry students).

**411, 412, 413. Forestry Seminar.** Current forestry topics. Required.

**436. Soil Erosion Control.** (A. E. 436) (Soils 436). Field work to study soil type characteristics by profiles, to map selected areas, certain farms and eroded lands. Forests in relation to watershed protection and erosion control; trees used, methods of planting and protection. Engineering aspects of soil erosion and its control; soil saving checks and dams; terracing. Prerequisite: Soils 254 (except for agricultural engineering students). Summer, 10 weeks, credit 10 or may be divided with Ag. Engr. and/or Soils.

**438. Lumber Markets.** (Ec. 438.) Economics of the timber industry. Wholesaling and retailing. Exports and imports of lumber and other forest products; prices; lumbermen's associations; freight rates, etc. Prerequisite: Ec. 231. Winter. Lect. and rec. 4. Credit 4.

**440. Special Problems.** Original investigations in advanced technical work, the subject to be chosen after consultation with the Forestry faculty. Fall, Winter, Spring. Credit 2 to 6 each quarter.

**470. General Forestry Economics.** (Ec. 470.) Elementary application of economics to forestry. Production, distribution, and consumption of forest products. Production management of forests. Prerequisite: Ec. 231. Spring. Rec. 3, credit 3.

**487. Forest Products.** Production of paper pulp, veneer, ties, lath, shingles, tanbark, naval stores, etc. Wood distillation. Winter. Rec. and lect. 5. Credit 5.

**488. Commercial Woods.** For Engineering students. Seasoning and kiln drying; defects and grading; characteristics and identification of timbers; preservation of timbers, poles, ties, etc. Winter. Lectures and rec. 2. Lab. 1, 3 hr. Credit 3.

**494. Forest Management.** Regulation for a sustained yield. Working plans for national, private, and European forests. Present practice of forestry. Fall. Rec. 4. Credit 4.

**495. Forest Range Administration.** The management and administration of the range on National and State forests and other public areas. Prerequisite: 398. Winter. Lect. and rec. 3. Credit 3.

**496. Forest Range Management Plans.** The preparation of detailed range management plans for the different National Forest regions of the country. Prerequisite: 398, 495. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

**506. Advanced Forest Planting.** Reforestation on eroded lands. Gully planting. Results of experimental work. State, federal, and private activities. Spring. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

**600. Research.** Messrs. MacDonald, Thomson, Larsen.

**604. Advanced Silviculture.** Research methods in silviculture. Studies in silvicultural practice in given regions and under special conditions of marketing, land use, climatic, edaphic, and biotic conditions. Prerequisite: 303; Bot. 205. Fall. Credit 2 to 5. Mr. Larsen.

**606. Advanced Planting.** Detailed studies of forest nurseries. Special problems in timber planting and reforestation work. Lect. and readings. Prerequisite: 206. Spring. Credit 2 to 5. Mr. Larsen.

**634. Advanced Lumbering.** Special investigations and reports on logging, milling, transportation, and marketing forest products. Conference and special assignments. Prerequisite: 224. Fall. Credit 2 to 5. Mr. MacDonald.

**688, 689. Forest Industries** Industries depending on forest products, including paper and pulp, veneer, cooperage, turpentine, wood distillation. Prerequisite: 487. Winter, Spring, respectively. Lectures and assignments. Credit 2 to 5 each quarter. Mr. MacDonald.

**694. Advanced Forest Management.** Special problems in the regulation of yield in the forest. Study of working plans. Prerequisite: 494. Fall. Conference, readings, and laboratory. Credit 2 to 5. Mr. Thomson.

**697. Advanced Forest Protection.** Injuries to forests, especially by fire. Study of detailed fire plans. Timber protective associations and their work. Conferences and readings. Prerequisite: 397. Winter. Credit 2 to 5. Mr. Thomson.

**Dendrology.** Botany 256, 257. See page 195.

**Surveying.** C.E. 116, 311, 312, 313. See pages 214, 215.

**Forest Insects.** Zool. 377. See page 339.

**Plant Pathology.** Bot. 416. See page 195.

**Chemistry of Forest Products.** Chem. 259. See page 208.

**Forest Soils.** Soils 374. See page 180.

## GENERAL ENGINEERING

FRANK D. PAINE, Head of Department

Professor Dana; Associate Professor Hempstead; Instructors Hillyard, Ohlsen.

*For information concerning the Division of Engineering, see page 125.*

The curriculum in General Engineering is intended for students who have an interest in business or management and who also have aptitudes in engineering and plan to train themselves for some phase of business operations with technical enterprises. It combines the basic technical training courses in science and engineering with courses in industrial and business management. It develops the facilities to analyze and solve the problems of the business departments of industry; it provides the fundamental training for factory management or production, and for commercial work in sales or application of equipment. It prepares the student to enter the fields of valuation and statistics in federal or state positions, with investment concerns, or insurance companies.

In addition to the fundamental engineering, courses in electricity, mechanics, surveying, structures and power measurements, engineering courses in valuations, contracts, scientific management, employment methods and personnel supervision are included. These are supplemented by courses in business management, accounting, industrial marketing, corporate finance, money and banking, industrial relations, business law, economics of utilities, investments, and industrial and sales psychology.

Opportunity is given in the last two years of this curriculum to elect group options in factory organization and management, personnel administration, engineering valuation, sales engineering, business administration or technical journalism. It is possible for the student to elect general subjects in certain other departments of the College.

The department also offers a group of courses, three of which are required of all engineers, known as Engineering Problems. The instruction supplements that of certain courses in mathematics by showing the practical application of various mathematical principles. Students are also trained to produce neat, clear, systematic computation sheets which will meet a typical set of specifications.

### Curriculum In General Engineering

Leading to the degree of Bachelor of Science.

For professional degree, see page 144.

For entrance requirements, see page 99.

## FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
College Algebra		Plane Trigonometry		Plane Analytic Geometry	
Math. 101	5	Math. 102C	4	Math. 103	5
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
Drawing and Projection		Theory of Project. Draw.		Industrial History	
Engr.Dr. 181	2	Engr.Dr. 182	3	Hist. 235	3
Engineering Problems		Engineering Problems			
Gen.E. 104	1	Gen.E. 105	1		
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	<u>16</u>		<u>16</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., Gen.E. 100 (Spring).

## SOPHOMORE YEAR

Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Mechanics and Heat		Elect. and Magnetism		Sound and Light	
Phys. 221	5	Phys. 222	5	Phys. 223	5
Engineering Economics		Engineering Economics		Business Management	
Ec. 261	3	Ec. 262	3	Ec. 263	3
Working Drawings		Properties of Materials		Statics of Engineering	
Engr.Dr. 183	2	T.&A.M. 334	2	T.&A.M. 274	3
General Psychology		Extempore Speaking		Engineering Problems	
Psych. 204	3	P.S. 311	2	Gen.E. 206	1
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	<u>18</u>		<u>17</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Seminar, Gen.E. 213 (Spring).

Required Summer Course<sup>4</sup>

Mechanical Engineering 233 or General Engineering 325. Credit 3.

JUNIOR YEAR<sup>6</sup>

Mechanics of Materials		Dynamics of Engineering		Hydraulics	
T.&A.M. 324	5	T.&A.M. 344	4	T.&A.M. 378	4
D.C. Machines		A.C. Circuits & Machines		A.C. Machines	
E.E. 333	3	E.E. 339	3	E.E. 340	3
Elect. Laboratory		Elect. Laboratory		Elect. Laboratory	
E.E. 343	1	E.E. 349	1	E.E. 350	1
Employment Meth. and		Accounting		Cost Accounting	
Employee Development		Ec. 374	4	Ec. 376	4
Gen.E. 354	3	Business Correspondence		Power Measurements	
Writing—Scientific Papers		Engl. 404	2	M.E. 354	1
Engl. 414	3	Materials Laboratory		Time Studies	
		T.&A.M. 327	1	M.E. 455	2
				†American Government	
				Govt. 315	3
*Electives	3	Electives	3		
	<u>18</u>		<u>18</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Gen.E. 311, 312, 313.

<sup>6</sup>Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

<sup>4</sup>Civil Engineering 300, summer camp, may be substituted for the shop work provided the student has credit in the required prerequisites.

<sup>6</sup>Before classification at the beginning of the Junior year, each student must choose a definite course of study to be followed during the Junior and Senior years. The electives may be chosen from any of the Engineering Departments, from the Department of Engineering Economics, the Department of Technical Journalism, or from Departments in the Division of Industrial Science. This course of study must have the approval of the head of the department.

†May be omitted by students appointed to the Reserve Officers' Training Corps. For full information see page 301.

SENIOR YEAR<sup>7</sup>

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Money and Banking		Industrial Marketing		Cost Estimating	
Ec. 304	3	Ec. 568	5	Gen.E. 486	3
Corporate Finance		Industrial Engineering		Engineering Contracts	
Ec. 474	3	M.E. 486	3	Engr. 405	3
Engineering Valuation		Elements of Structures		Extempore Speaking	
Engr. 407	3	C.E. 385	5	P.S. 312	3
Surveying		Personnel Supervision		Industrial Relations	
C.E. 325	3	Gen.E. 425	3	Ec. 406	3
Industrial Organization		*Electives	3	*Electives	5
M.E. 484	3				
*Electives	3				
	<hr/> 18		<hr/> 19		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Gen.E. 411, 412 (Fall, Winter); Senior Inspection Trip, Gen.E. 400.

<sup>7</sup>Courses in the Junior year not required as prerequisite to courses taken in the Senior year may be shifted to the Senior year.

\*One credit may be chosen from: Music 144 (1). For full information concerning the Reserve Officers' Training Corps, see page 301.

## Description of Courses

100. **Technical Lectures.** Lectures and conferences designed to aid the freshman student in adjusting himself both in his course and in college environments. Spring. Lect. 1. Required.

101. **Personal Development.** Individual analysis and development of interests, traits, abilities, aptitudes, and capacity and their relations to the requirements of industry. Spring. Lect. 1. Credit 1.

104. **Engineering Problems.** Computation forms and methods, training in recording engineering computations in a clear and systematic manner. Fundamentals of the slide rule. Practical applications of algebra and arithmetic to problems in engineering, supplementing the instruction in Math. 101. Prerequisite: credit or classification in Math. 101. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1.

105. **Engineering Problems.** Practical problems based upon engineering applications of plane trigonometry, supplementing instruction in Math. 102C. Further training in organization of computations, computation forms and methods. Prerequisite: Credit or classification in Math. 102C. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1.

204. **Engineering Problems.** Primarily for students who enter with advanced standing, and who are not required to take Gen. E. 104 and 105. The course is intended to familiarize these students with the slide rule, and to train them to record their work in clear, systematic form. Elementary problems in quantity surveying and estimating. Prerequisite: Math. 102C. Fall, Winter. Lab. 1, 3 hr. Credit 1.

206. **Engineering Problems.** Practical problems based upon some of the engineering applications of the calculus. Supplementing the instruction in Math. 213, and co-operating with mechanics. Problems dealing with centroids and second moments, graphic and semi-graphic methods of integration and differentiation. Prerequisite: 105 or 204, and credit or classification in Math. 213. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1.

213. **Seminar.** Required of all Sophomore students. Spring.

311, 312, 313. **Seminar.** Fall, Winter, Spring, respectively. Rec 1. Required each course.

325, 326. **Summer Work.** Approved summer work in an industrial plant. Credit 3 each course.

354. **Employment Methods and Employee Development.** The principles and technique of employment methods and their relation to industrial development. Prerequisite: senior college classification. Fall. Rec 2 Lab. 1, 3 hr. Credit 3.

400. **Senior Inspection Trip.** One week spent in Chicago or other industrial centers, visiting and inspecting industrial plants. Prerequisite. Senior Gen. E. classification. Fall. Required.

406. **Alignment Charts for Engineering Formulae.** Construction of conversion scales, alignment charts and similar devices for solving various engineering equations. Prerequisite: Math 213. Alternate years. Offered Spring 1938. Rec. 1. Lab. 1, 3 hr. Credit 2.

- 411, 412. Seminar. Fall, Winter, respectively. Rec. 1. Required each course.
416. **Graphical Analysis of Engineering Problems.** Studies of graphical methods of solving various experimental problems arising in engineering practice. Prerequisite: Math. 213. Alternate years. Offered Spring 1939. Rec. 2. Lab. 1, 3 hr. Credit 3.
425. **Principles of Personnel Supervision.** Discussion of a series of cases of the general variety of human contacts which arise in the course of employment, with the desirable methods to meet such conditions when they occur. Prerequisite: Senior classification. Winter, Spring. Rec. 3. Credit 3.
436. **Cost Estimating.** Application of fundamentals of engineering and economics to the planning, development, and management of industrial projects. Prerequisite: Senior classification in Engineering. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.
494. **Special Problems.** Formulation and solution of theoretical or practical problems which relate to manufacturing, public utility operation, operation of communication systems or other industrial methods. Credit 1 to 5.
694. **Industrial Engineering Research.** Mr. Paine.

## GENETICS

E. W. LINDSTROM, Head of Department

Professor Gowen; Instructor Hetzer

*For information concerning the Division of Agriculture, see page 120.*

The department of Genetics offers instruction in the science of heredity particularly in relation to plant and animal breeding. Students planning to specialize in animal or plant breeding will find it essential to obtain a detailed knowledge of Genetics. In addition to emphasizing the applied or practical phases of genetics, the courses are also designed to stimulate the broader cultural and philosophical aspects of this biological science. The relation of genetics to mankind is brought up for serious consideration.

Experimental work in Genetics is under way at all times, and provides facilities for advanced study for those interested in Genetics, or in similar problems in the allied fields of Animal Husbandry, Bacteriology, Botany, Farm Crops, Horticulture, or Zoology.

Offices, classroom, laboratory, and research rooms of the department are located on the third floor of Agricultural Hall. Greenhouse space, an animal breeding laboratory, and experimental field-plots are available for advanced work.

Applied courses in genetics are also given in various departments as follows: Animal Husbandry 350 (Animal Breeding), 548 (Poultry Breeding); Farm Crops 504 (Cereal and Forage Crop Breeding), 619 (Conferences in Crop Breeding); and Horticulture 518 (Breeding of Horticultural Plants.)

### Description of Courses

300. **General Genetics.** Elementary principles of heredity and their general bearing on plant and animal breeding. Prerequisite: A course in botany or zoology. Fall, Winter. Lect. 3. Credit 3.

305. **Elementary Laboratory.** Breeding experiments, illustrating the principles of heredity. Should accompany or follow 300. Fall, Winter. Lab. 1. Credit 1.



310. **Human Heredity.** Elementary principles of genetics with particular reference to eugenic problems. Not open for credit to students taking or having had Genetics 300. Prerequisite: elementary botany or zoology. Alternate years. Offered Fall, 1937. Lect. 3. Credit 3.

530. **Advanced Genetics.** Modern conceptions of genetics, including Mendelism, linkage, mutation, selection, inbreeding, disease resistance, and biometry. Prerequisite: elementary genetics. Winter. Lect. and problems 3. Credit 3. Mr. Lindstrom.

535. **Animal Genetics.** Advanced study of inheritance in animals. Prerequisite: elementary genetics. Spring. Lectures and problems 3. Credit 3. Mr. Gowen.

540. **Special Topics.** Written problems in laboratory, greenhouse, field or library work. Prerequisite: elementary genetics. Fall, Winter, Spring. Credit 1 to 3 as arranged. Mr. Gowen.

550. **Seminar** Weekly meeting with staff to report and discuss current literature. Fall, Winter, Spring. Credit 1. Mr. Lindstrom.

600. **General Genetics.** An orientation course including a comprehensive problem in *Drosophila* genetics. Fall, Winter. Lect. 3. Lab. 1. Credit 3. Mr. Lindstrom.

651, 652, 653. **Conferences on Animal Breeding Systems.** (A. H. 651, 652, 653.) Biometric relations between parent and offspring, inbreeding and outbreeding, assortative mating, the effects of selection. Application of these principles to progeny tests, selection indices, records of performance, etc. Prerequisite: 600, A. H. 350, or equivalent. Fall, Winter, Spring. Credit 2 each course. Mr. Lush.

660. **Research.** Mr. Lindstrom, Mr. Gowen.

## GEOLOGY

J. T. LONSDALE, Head of Department

Associate Professor Gwynne; Assistant Professor Smith;  
Instructor Cline

*For information concerning the Division of Industrial Science, see page 131.*

The department offers fundamental courses in geology designed to give the student a knowledge of the composition of the earth, the processes which are at work upon it, and its history. For those who plan to engage in professional work in the field of geology a sequence of more advanced courses in the various sub-divisions of the science is provided, continuing through the Junior and Senior years. In the Senior year such students may take courses particularly applicable to specialized fields of geology. At least one year of graduate work is essential for those planning to engage in professional geological work.

The advanced courses in geology offered for the majors include those in mineralogy, petrology, petrography, paleontology, structural geology, stratigraphic geology, and economic geology. Various ones of these are included in the curricula in Mining Engineering and in Ceramic Engineering, and may be taken by others who are qualified. One quarter courses in elementary geology, mineralogy, and meteorology, suited to the diverse needs of students in agriculture, landscape architecture, civil engineering, and chemical engineering are also offered by the department. Fundamental work in geography is given for those wishing to gain a knowledge of the relation of agriculture and industry to the geographic environment.

The quarters of the department are located on the second floor of the Chemistry Building, and include a well-equipped museum containing many valuable collections of minerals, rocks, and paleontological specimens.

### Curriculum In Industrial Science—Major Geology

For Freshman and Sophomore years, see page 285.

For Junior and Senior years, see page 286.

Summer Field Work (Geol. 400) or equivalent is required for graduation.

#### Description of Courses

201, 202, 203. **General Geology. Fundamentals.** (201) Composition of the earth; gradation. Fall, Winter, Spring. (202) Diastrophism, vulcanism; introduction to earth history. Winter, Spring. (203) Historical geology. Spring. Rec. 3. Lab. 1, 3 hr. Lab. optional. Credit 3 or 4 each course.

311, 312, 313. **Industrial Geography.** Principles of the science. (311) Applications to human relations and the fundamental industries of the world. (312) Applications to human interests in international affairs. (313) Applications to world resources and human welfare. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

314. **Agricultural Geography.** The distribution of the agricultural lands, industries, products and peoples of the world and the geographic causes of this distribution. Winter, Spring. Rec. 3. Credit 3.

324. **Physiography.** Evolution of the physical features of the earth; fundamental processes affecting their development. Spring. Rec. 4. Credit 4.

354. **Structural Geology.** The primary and secondary structures of the rocks of the earth's crust. Prerequisite: 201, 202, 203. Fall. Rec. 3. Lab. 1, 3 hr. Credit 4.

355. **Mineralogy.** The fundamentals of crystallography and of determinative and descriptive mineralogy. Prerequisite: Chem. 102. Winter. Rec. 3. Lab. 1, 3 hr.. Credit 4.

356. **Petrology.** The physical, mineralogical, textural, and structural characteristics of rocks; their origin and distribution. Prerequisite: 355. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

374. **Engineering Geology.\*** The fundamentals of the science and engineering applications. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

375. **Agricultural Geology.\*** The fundamentals of the science and agricultural applications. Fall, Spring. Rec. 2. Field and lab. 1, 3 hr. Credit 3.

376. **Meteorology.** The nature of the air, winds, weather, and climate. Winter, Spring. Rec. 3. Credit 3. 1 or 2 labs. for additional credit.

400. **Summer Field Work.** Field phenomena; geologic surveying and mapping. Prerequisite: 201, 202, 203. Summer, first term. Credit 4 to 9.

434. **Economic Geology—Non-Metallics.** Origin, occurrence, and uses of the principal non-metallic mineral deposits. Prerequisite: 354, 356. Fall. Rec. 3. Lab. 1, 3 hr. Credit 4.

435. **Invertebrate Paleontology.** Characteristics and relationships of the invertebrates of the fossil record; their use in historical geology. Prerequisite: 201, 202, 203; Zool. 104, 105. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

436. **Petroleum Geology.** Origin and manner of occurrence of oil and gas; geological characteristics of important producing regions. Prerequisite: 354. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

454. **Optical Mineralogy.** Principles involved in the study of minerals with the polarizing microscope; the characteristics of the principal rock-forming minerals. Prerequisite: 355. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

455. **Economic Geology—Metallics.** The character and origin of ore deposits. Prerequisite: 354, 356. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

557, 558. **Petrography.** Rock sections and powders studied with the polarizing microscope. (557) Igneous rocks. Winter. (558) Sedimentary and metamorphic rocks. Spring. Prerequisite: 454. Rec. 2. Lab. 2, 3 hr. Credit 4 each course. Mr. Lonsdale.

566. **Seminar.** Prerequisite: 12 credits in geology. Fall, Winter, Spring. Credit 1 each time elected. Mr. Gwynne.

\*Geol. 374, and 375 are acceptable in substitution for Geol. 201 for engineering and agricultural students who desire to elect Geology 202 and 203.

567, 568. **Invertebrate Paleontology.** Application of paleontology to stratigraphic correlation and interpretation of earth history. (567) Paleozoic. Winter. (568) Mesozoic and Cenozoic. Spring. Prerequisite: 435. Rec. 3. Lab. 1, 3 hr. Credit 4 each course. Mr. Cline.

571, 572, 573. **Advanced General Geology.** Principles of dynamical, structural, and stratigraphic geology; phenomena of earthquakes; vulcanism; mountain making; form and structure of the earth and its past history. Prerequisite: 354, 356. Fall, Winter, Spring, respectively. Rec. 3. Lab. 1, 3 hr. Credit 4 each course. Messrs. Cline, Lonsdale, Gwynne.

574. **Petrography of Ceramic Materials.** Examination of ceramic materials with the petrographic microscope; technique of examination of fine mineral particles; geological occurrence; and characteristics of ceramic materials. Prerequisite: 454. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Lonsdale.

664. **Special Topics.** Prerequisite: 36 credits in geology. Mr. Lonsdale, Mr. Gwynne.

665. **Research.** Mr. Lonsdale, Mr. Gwynne.

## HISTORY AND GOVERNMENT

L. B. SCHMIDT, Head of Department

Associate Professors Cook, Moody, Ross; Instructors Cochran, Norby

*For information concerning the Division of Industrial Science, see page 131.*

The department provides basic courses of instruction in history and government for students in all divisions of the College; fundamental and specialized courses for teachers; and research work in economic history along either major or minor lines. These subjects are included: first, to furnish such knowledge and training as it is believed should be part of any college education; second, to provide advanced work for those students who need a more thorough knowledge of history and government for teaching or for public service; and, third, to train men and women for intelligent citizenship. The college library offers good facilities for both undergraduate and graduate students in these subjects.

### Curriculum In Industrial Science: Major Economic History

For Freshman and Sophomore years, see page 285.

For general instructions regarding the Junior and Senior years, see page 286.

### Description of Courses

#### HISTORY

Note: Any subject listed in the following History sequences may be taken independently: 401, 402, 403; 421, 422, 423; 554, 555.

211, 212, 213. **Introduction to the Social Sciences.** Western civilization and the problems of contemporary society. (Does not take the place of any of the introductory courses in the social sciences.) (211) An historical survey of the economic, political, and social institutions of western civilization in ancient, medieval, and modern times intended primarily as a background for the study of the institutions, ideas, and problems of the present. (212) Continuation of 211 which is prerequisite. (213) Consideration of the more important institutions, problems, and ideals of contemporary life. Prerequisite: 212. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

234, 235. **Economic History of the United States.** (234) *To 1860.* European and environmental foundations; colonial origins of agriculture, industry, and commerce; expansion and sectional division. Winter. (235) *Since 1860.* The triple economic revolution in agriculture, industry, and transportation; national unification and consolidation; problems and tendencies. Spring. Rec. 3. Credit 3 each course.

324. **Economic History of the United States.** Colonial foundations; the westward movement; the public lands; transportation; regional specialization; the revolution in agriculture, industry, and commerce; the labor movement; the farmers' movement; currency and banking; the tariff; and economic aspects of the World War and reconstruction. Not open to students who have had 234 or 235. Fall, Winter, Spring. Rec. 3. Credit 3.

401, 402, 403. **Economic History of Europe.** (401) *England.* English agriculture, industry and commerce from the Anglo-Saxon conquest to the present with emphasis on the development of economic institutions. Prerequisite: 3 credits of history. (402) *Modern Europe.* European agriculture, industry, and commerce since 1760, with emphasis on the development of economic institutions. Prerequisite: 3 credits of history. (403) *European Expansion and World Politics.* Causes, motives, workings, and effects of contemporary European expansion in Africa, the Near East, the Middle East, the Far East, and the Pacific Islands. Prerequisite: 3 credits of history. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

421, 422, 423. **History of the American Nation.** (421) *Foundations to 1789.* European background; colonial development and institutions; British colonial policy; causes of the revolution; the birth of the nation; and the establishment of the Constitution. Prerequisite: 6 credits of history. (422) *The Middle Period from 1789 to 1865.* Westward expansion; land questions; political parties and party problems; the rise of the New West; industrial and agricultural expansion; cultural development; foreign relations; slavery; and the War between the States. Prerequisite: 6 credits of history. (423) *The Recent Period from 1865 to the Present.* The economic revolution; the new issues with their economic, political, and intellectual background; and the emergence of the United States as a world power. Prerequisite: 6 credits of history. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

496. **Methods of Teaching the Social Sciences.** (Voc. Ed. 496.) Methods of teaching history, government, economics, and sociology in the high school and junior college. Prerequisite: 15 credits of history including Hist. 211, 212, 213, or equivalent; Govt. 315; Ec. 201, 202. Alternate years. Offered Winter, 1939. Rec. 3. Credit 3.

520. **History of American Agriculture.** Colonial foundations; westward movement of population and agricultural systems; public land policies in relation to agricultural expansion; regional specialization; transportation; home and foreign markets; agrarianism and industrialism; the farmers' movement; politics and legislation; present agricultural situation. Prerequisite: 324 and 6 credits of advanced history or equivalent. Winter. Rec. 3. Credit 3. Mr. Schmidt.

534. **The Trans-Mississippi West.** European and aboriginal backgrounds; territorial acquisitions; the westward movement; economic, social, and political development. Special attention given to the Prairies and the Great Plains in American History. Prerequisite: 9 credits of history. Fall. Rec. 3. Credit 3. Mr. Ross.

554, 555. **Foreign Relations of the United States.** (554) *Foundations and Expansion, 1775-1898.* European background; the French alliance and independence; neutrality and neutral rights; Louisiana and Florida; the Monroe Doctrine; Oregon, Texas, and the Mexican War; Caribbean problems; the Far East; the Civil War; Anglo-American arbitrations; and the Spanish-American War. Prerequisite: 9 credits of history. (555.) *World Politics, 1898-1938.* Interests and policies of the United States in Latin America; the Far East and problems of the Pacific; intervention in Europe and post war problems and tendencies; economics and diplomacy. Prerequisite: 9 credits of history. Winter, Spring, respectively. Rec. 3. Credit 3 each course. Mr. Schmidt.

565. **The United States and Latin America.** Economics, political, strategic, and humanitarian factors in our relations with the countries composing Latin America and the foreign policies of the United States as they have been adapted to expanding national interests. Prerequisite: 9 credits of history. Spring. Rec. 3. Credit 3. Mr. Norby.

568. **History of International Relations.** An historical and comparative survey of economic foreign policies of the Great Powers as they have been adapted to expanding interests, and the bearing of these policies on international relations and on the problems of international organization. Prerequisite: 324 and 6 credits of advanced history or equivalent. Fall. Rec. 3. Credit 3. Mr. Schmidt.

595. **Seminar in Economic History.** Fall, Winter, Spring. Credit 2 or 3 each quarter. Mr. Moody, Mr. Ross.

604. **Research in Economic History.** Messrs. Moody, Ross, Schmidt.

## GOVERNMENT

**315. American Government.** Fundamental principles; organization, functions, and workings of the federal system; relation of the national government to agriculture, industry, business, and commerce; rights and duties of citizenship. Fall, Winter, Spring. Rec. 3. Credit 3.

**424. State and Local Government in the United States.** Historical foundations; present organization and functions; special problems, including the reorganization of state and local administration; financial and budgetary proposals; civil service principles. Prerequisite: 315. Fall. Rec. 3. Credit 3.

**435. Municipal Government.** Historical foundations of American city government; city manager form of government and city manager problems; efficiency in city government. Prerequisite: 315. Winter. Rec. 3. Credit 3.

**436. Municipal Problems.** The city in action; problems of administrative organization and personnel; legal aspects of city planning and zoning; municipal finance; regulation of public utilities; municipal ownership; special problems of municipal administration arising out of the depression. Prerequisite: 315. Spring. Rec. 3. Credit 3.

**446. European Governments.** Comparative examination of the governments of England, France, Germany, Italy, and Switzerland; political problems of these countries; comparisons with the United States. Prerequisite: 315. Spring. Rec. 3. Credit 3.

**468. Political Parties and Party Problems.** Historical development of political parties; bases of party affiliations; party organization; selected party problems, including the direct primary, party finance, and the conduct of elections; party issues. Prerequisite: 315. Alternate years. Offered Fall, 1938. Rec. 3. Credit 3.

**476. Public Administration.** Principles applied to national, state, and local governments; problems of organization, personnel, equipment, and financial procedure; reorganization of government; current problems and tendencies in Iowa. Prerequisite: 315. Winter. Rec. 3. Credit 3.

**495. Special Topics.** State or rural governments; the recovery administration of the national government; current party problems.

## HOME ECONOMICS

GENEVIEVE FISHER, Dean of Home Economics

*For information concerning the Division, see page 129.*

The Division of Home Economics offers the following curricula leading to the degree of Bachelor of Science:

	Page		Page
Applied Art . . . . .	254	Technical Journalism . . . . .	274
Child Development . . . . .	257	Home Management . . . . .	266
Foods and Nutrition with major in:		Household Equipment . . . . .	268
Dietetics . . . . .	260	Institution Management . . . . .	270
Experimental Cookery . . . . .	261	Textiles and Clothing . . . . .	272
Nutrition . . . . .	261	Textiles and Chemistry . . . . .	278
Related Science . . . . .	262		
Home Economics Education . . . . .	264		
Home Economics with major in:			
Extension . . . . .	265		

Graduate work leading to the degree of Master of Science is offered by all departments in the division. See page 140.

Courses in the Divisions of Agriculture, Engineering, and Industrial Science are open to Home Economics students as electives. Certain basic subjects are required in each of the various curricula and a uniform Freshman year precedes the choice of curricula.

## Curricula In the Division of Home Economics

For entrance requirements, see page 99.

## UNIFORM FRESHMAN YEAR

Fall Quarter	Credits <sup>2</sup>	Winter Quarter	Credits	Spring Quarter	Credits
Elementary Design A.A. 104 <sup>1</sup>	2	Elementary Design A.A. 105	3	Household Equipment H.Eq. 154	3
General Chemistry Chem. 105	4	General Chemistry Chem. 106	4	†General Physics Phys. 106	4
Composition Engl. 101	3	Composition Engl. 102	3	†Composition Engl. 103	3
Health Education Hyg. 104	3	Textiles T.&C. 104	3	Biology Zool. 104	3
Introd. to Social Sciences Hist. 211	3	Introd. to Social Sciences Hist. 212	3	Introd. to Social Sciences Hist. 213	3
Physical Education Phys.Ed. 121	R <sup>3</sup>	Physical Education Phys.Ed. 122	R	Physical Education Phys.Ed. 123	1*
	<u>15</u>		<u>16</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in her schedule: H.Ec. 101, 102, 103.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

<sup>3</sup>R indicates that the course is required, without credit, for graduation.

†Those who plan to elect the curriculum in Related Science or in Textiles and Chemistry (see pages 262, 273) must elect Chem. 103 in place of Physics 106.

\*One credit is given upon the completion of three quarters' work.

‡Students making less than a quality point average of 1.5 in Freshman English will be required to enroll for additional work in English Composition.

## SOPHOMORE, JUNIOR, AND SENIOR YEARS

At the beginning of the Sophomore year each student must choose one of the following curricula: Applied Art; Child Development; Foods and Nutrition with major in Dietetics, Nutrition, Experimental Cookery, Related Science; Home Economics Education; Home Management; Household Equipment; Institution Management; Textiles and Clothing; Textiles and Chemistry; Home Economics with major in Home Economics Extension, or Technical Journalism.

For details of the above curricula, see the following pages.

## Description of Courses

101, 102, 103. **Orientation.** (101) Social ethics. Application of standards of social conduct to daily life. Fall. Six lectures. Lib. 106B. Six lectures. Required. For freshman women. (102, 103.) Survey of opportunities in the field of home economics as a basis for choice of major. Winter, Spring. Required of all freshmen in home economics. Lect. 1. Required each course.

## APPLIED ART

JOANNE M. HANSEN, Head of Department

Associate Professors Fisher, O'Bryan; Assistant Professors Henderson, Russell; Instructors Kitt, Lepley, Ness, Teter, Waugh;  
Extension Workers Garner, Wilson, Workman

The Department of Applied Art offers instruction involving the use of art elements and the application of fundamental design principles to the needs of the individual and the home.

The courses are planned with the objectives of creating a more sensi-

tive consciousness of good design and of beauty; of promoting a strong desire to eliminate or transform ugliness into beauty; of acquiring certain skills and appreciations that will enrich life and make leisure more profitable; of developing good judgment, wise selection and discrimination in the buying and use of material things in relation to daily living and to the home; of realizing the importance which the general public, periodicals, daily papers, advertising and industry give to art qualities found in the things of every day life; of knowing the work of contemporary designers.

There is a growing demand in professional and commercial fields for women trained in applied art who have the home economics viewpoint. For teachers and extension specialists in home furnishing; for merchandise advisors, buyers and designers; for assistant designers and consultants in interior decoration; for the many phases in commercial design, broad training is highly desirable.

Advanced credit students are requested to bring representative work.

### Curriculum In Applied Art

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

#### SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Drawing and Composition		Drawing and Composition		Drawing and Composition	
A.A. 221	2	A.A. 222	2	A.A. 223	2
Food Preparation		House Planning		Interior House Design	
F.&N. 204	4	A.A. 260	2	A.A. 264	3
Applied Organic		*Food Preparation		General Psychology	
Chem. 264	5	F.&N. 205	4	Psych. 204	3
Costume Design		Food Analysis		Clothing	
T.&C. 144	3	Chem. 266	3	T.&C. 224	3
Plan. Home Landscapes		Craft Design		Nineteenth Century	
L.A. 206	2	A.A. 345	2	Engl. 255	3
		Nineteenth Century	3	Music Appreciation	
		Engl. 254 or		Music 144	1
		Technical Journalism			
		T.Jl. 225B			
Physical Education		Physical Education		Physical Education	
Phys.Ed. 221	R	Phys.Ed. 222	R	Phys.Ed. 223	1**
	16		16		16

\*Home Experience, F.&N. 207, required upon completion of F.&N. 205. See page 263.

\*\*One credit is given upon the completion of three quarters' work.

#### JUNIOR YEAR

Household Bacteriology		Meal Planning		Principles of Sociology	
Bact. 804B	5	F.&N. 803	4	Ec. 384	3
Principles of Economics		Principles of Economics		Ec. of Consumption	
Ec. 211	3	Ec. 212	3	Ec. 213	3
Child. & Adolescence		Amer. Masterpieces	8	Extempore Speaking	
Psych. 415	3	Engl. 364 or		P.S. 311	3
Cons. & Decor. Design		Fiction		Hand Made Pottery	
A.A. 344	2	Engl. 454,455,456		Cer.E. 324	2
Electives	3	American Government	3	Draw. & Composition	
		Govt. 315		A.A. 524	2
		Commercial Design		Electives	3
		A.A. 305	2		
		Electives	2		
	16		17		16

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Art Appreciation		Art Appreciation		Art Appreciation	
A.A. 484	8	A.A. 585	2	A.A. 586	2
Textile Design		Textile Design		Manuscript Decoration	
A.A. 484	8	A.A. 585	2	A.A. 507	2
Child Care and Training		Home Management		Craft Design	
C.D. 485	8	H.Mgt. 474	8	A.A. 546	2
Advanced Composition		Home Mgt. House		Interior House Design	
Engl. 304	8	H.Mgt. 475	4	A.A. 565	3
Electives	3	Historic Textiles		Drama	
		T.&C. 514	3	Engl. 464	3
		Electives	8	Electives	8
	<hr/> 15		<hr/> 17		<hr/> 15

## Description of Courses

104. **Elementary Design.** Elements of design, and the development and application of fundamental art principles and color theories through problems in art structure. Fall, Winter. Lab. 3, 2 hr. Credit 2.

105. **Design.** Problems and projects in design requiring judgment in selection and creative work in the use of line, form, dark and light, color and texture. Prerequisite: 104. Fall, Winter, Spring. Rec. 1. Lab. 3, 2 hr. Credit 3.

221, 222, 223. **Drawing and Composition.** (221) Rapid sketching and free expression with wide range of subjects and mediums. (222, 223) Perspective, landscape and figure sketching in line, form, and color with emphasis upon dark and light, and unity in composition. Prerequisite: 221. (223) Prerequisite: 222. Fall, Winter, Spring, respectively. Lab. 3, 2 hr. Credit 2 each course.

260. **House Planning.** The exterior and interior of the house planned for convenience, economy, and beauty. Prerequisite: 105. Fall, Winter, Spring. Lab. 3, 2 hr. Credit 2.

264. **Interior House Design.** The furnishing of a home of moderate means, as planned in 260, considering convenience, comfort, simplicity and beauty. Prerequisite: 260. Fall, Winter, Spring. Rec. 1. Lab. 3, 2 hr. Credit 3.

305. **Commercial Design.** Lettering and design in dark and light and color in relation to advertising art with mediums suitable for reproduction. Prerequisite: 105. Winter. Lab. 3, 2 hr. Credit 2.

344. **Constructive and Decorative Design.** Problems in wood carving, weaving, and rug design. Prerequisite: 105. Fall, Winter. Lab. 3, 2 hr. Credit 2.

345. **Craft Design.** Book-binding, leather, and metal. Prerequisite: 105. Winter, Spring. Lab. 3, 2 hr. Credit 2.

400. **Special Problems.** Fall, Winter, Spring. Credit and hours as arranged.

434. **Textile Design.** Tie-dye, batik, and block printing; contemporary designers and textiles. Prerequisite: 105, T. & C. 104. Fall, Winter, Spring. Lect. and lab. 2, 3 hr. Credit 3.

445. **Constructive and Decorative Design.** The development of original pattern and color combinations through textile weaving. Prerequisite: 344. Spring. Lab. 3, 2 hr. Credit 2.

484. **Art Appreciation.** A survey of architecture, sculpture, and painting from prehistoric to modern times. Prerequisite: 105. Fall, Winter, Spring. Lect. 3. Credit 3.

504. **Seminar.** Credit and hours as arranged. Winter. Miss Hansen.

507. **Manuscript Decoration.** Decorative motives and ancient styles of lettering, with emphasis upon original modern adaptations. Prerequisite: 305. Spring. Lab. 3, 2 hr. Credit 2. Miss O'Bryan.

524. **Drawing and Composition.** Decorative composition in dark and light and color, based upon previous sketches and assigned subjects. Prerequisite: 223. Spring. Lab. 2, 3 hr. Credit 2.

535. **Textile Design.** Creative design appropriate for batik and decorative stitchery, with emphasis upon use, composition, color, and technique. Prerequisite: 434. Winter. Lab. 2, 3 hr. Credit 2. Miss O'Bryan.



546, 547. **Craft Design.** (546) Metal working, silver smithing, and jewelry. Prerequisite: 345. Spring. (547) Constructive application of design to leather, metal, wood, and other materials. Prerequisite: 344, 345. Spring. Lab. 3, 2 hr. Credit 2 each course. Miss Fisher.

565, 566. **Interior House Design.** Scale, line, form, value, texture, and color in the selection, use and adaptation of period and contemporary furnishings of distinctive styles to homes of today. (565) Spring. Prerequisite: 264. (566) Spring. Prerequisite: 565. Rec. 1. Lab. 2, 3 hr. Credit 3 each course. Miss Henderson.

585, 586. **Art Appreciation.** Prerequisite: 484, Hist. 211. (585) Medieval and Renaissance Art. Winter. (586) Modern and Contemporary Art. Spring. Rec. 2. Credit 2 each course. Miss Hansen.

604. **Advanced Design.** Fall, Winter, Spring. Miss Hansen, Miss Henderson.

605. **Special Topics.** Fall, Winter, Spring. Miss Hansen, Miss Henderson.

614. **Research.** Miss Hansen, Miss Henderson.

## CHILD DEVELOPMENT

LYDIA V. SWANSON, Head of Department

Professor Vance; Assistant Professor Lowenberg; Instructors Chittendon, Sunderlin; Graduate Assistants Sandell, Spencer; Fellow McNeil; Extension Worker Jones

The purpose of this department is to give students a better understanding and appreciation of children. The four infants in the home management houses, the twenty-five nursery school children, ages two to five, the play groups made up of grade school children coming to the nursery school at stated times, offer unique opportunities to study child life at the various ages. In addition, the departments of nutrition, hygiene, physiology, psychology, and physical education offer courses which emphasize particular phases of child development.

Specialization in this department prepares students for nursery school teachers and nutritionists, also for leaders in parent education programs.

Through affiliation with the Merrill-Palmer School of Homemaking, Detroit, Michigan, two senior college students showing especial ability in the field of child development are elected every quarter to study at that institution. This privilege gives the students opportunities to become familiar with phases of child life which the College does not offer.

### Curriculum In Child Development

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

## SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Applied Organic Chem. 264	5	Food Chemistry Chem. 266	8	Physiol. & Nutr. Chem. Chem. 274	8
House Planning A.A. 260	2	Interior House Design A.A. 264	3	Principles of Economics Ec. 211	3
Human Physiology Zool. 255	5	Food Preparation F.&N. 204	4	Food Preparation F.&N. 205	4
General Psychology Psych. 204	3	Nineteenth Century Engl. 254 or Technical Journalism T.J.I. 225B	3	**Nineteenth Century Engl. 254 or 255 or Electives in English	3
Physical Education Phys.Ed. 221	R	Costume Design T.&C. 144	3	Clothing T.&C. 224	3
	<u>15</u>	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
			<u>16</u>		<u>17</u>

\*One credit is given upon the completion of three quarters' work.

\*\*Students who elect T.J.I. 225B in the Winter quarter will take Engl. 254 or 255.

## JUNIOR YEAR

Household Bacteriology Bact. 804B	5	Meal Planning F.&N. 303	4	Nutrition & Dietetics F.&N. 305	4
Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3	American Government Govt. 315	3
Child. and Adolescence Psych. 415	3	Child Care and Training C.D. 435	3	Play and Play Materials C.D. 440	3
Extempore Speaking P.S. 311	3	Principles of Sociology Ec. 384	3	Art Appreciation A.A. 484	3
Electives	3	Electives	3	Electives	3
	<u>17</u>		<u>16</u>		<u>16</u>

## SENIOR YEAR

Advanced Child Psych. Psych. 516	3	Tech. of Guidance C.D. 556	3	Tech. of Guidance C.D. 557	3
Home Management H.Mgt. 474	3	Home Relationships H.Mgt. 534	3	Children's Clothing T.&C. 526	3
Home Management H.Mgt. 475	4	Child Physiology Zool. 558	3	Physical Development C.D. 545	2
Seminar C.D. 465	2	Nutrition of Children F.&N. 506	3	Textile Economics T.&C. 564	2
Electives	4	Electives	3	Advanced Child Care C.D. 536	3
	<u>16</u>		<u>15</u>	Electives	3
					<u>16</u>

Suggested electives: Psych. 334, 424, 433; Voc.Ed. 304, 305, 306; A.A. 221; Engl. 304, 305; F.&N. 504; Ec. 385; P.S. 254; Cer.E. 324; Mod.Lang. 201, 202, 203; 231, 232, 233; I.A. 106; Gen. 310.

## Description of Courses

435. Child Care and Training. Factors involved in physical, mental, social, and emotional development of children, with discussion of problems in the home. Observation and participation in nursery school. Fall, Winter, Spring. Prerequisite: Psych. 415, F.&N. 205. Rec. 2. Lab. 1, 3 hr. Credit 3.

440. Play and Play Materials. An investigation of literature, music, art, clay modeling, together with play equipment suitable for pre-school children. Spring. Prerequisite: 435. Rec. 2. Lab. 1, 3 hr. Credit 3.

465. Seminar. Preparation and presentation of reports on original investigations in child development. Prerequisite: 435 and senior classification. Fall. Rec. 2. Credit 2.

**536. Advanced Child Care and Training.** For students majoring in child development, home economics education and other fields concerned with young children. Additional experience with young children and a survey of literature to give a better understanding of child life. Fall, Winter, Spring. Prerequisite: 435. Rec. 2. Lab. 1, 3 hr. Credit 3. Miss Swanson.

**545. Physical Development.** Emphasis on environmental factors as they influence health of infants and young children. Prerequisite: 435. Alternate years. Offered Spring, 1939. Rec. 1. Lab. 1, 3 hr. Credit 2. Miss Lowenberg.

**555. Special Topics.** Fall, Winter, Spring. Prerequisite: 435. Miss Swanson, Mr. Vance.

**556, 557. Techniques of Guidance.** Observation and practical experience in guidance of children in nursery school. Emphasis on growth through children's interests and activities. (556) Prerequisite: 440. Fall, Winter. Rec. 2. Lab. 1, 3 hr. Credit 3. (557) Prerequisite: 556. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3. Miss Swanson.

**614. Research.** Mr. Vance, Mr. Fritz.

**665. Seminar.** Fall, Winter, Spring. Miss Swanson, Mr. Vance.

**666. Nursery School Organization.** Administration of nursery schools with emphasis on budget, housing, equipment; staff, parent, and student participation. Prerequisite: 556. Winter. Rec. 2. Credit 2. Miss Swanson.

**667. Infant Care.** For those preparing to direct home management houses. Emphasis on the twenty-four hour care of infants. Prerequisite: 435, H. Mgt. 475. Summer, first term. Rec. 2. Lab. 4, 3 hr. Credit 3. Miss Swanson.

## FOODS AND NUTRITION

P. MABEL NELSON, Head of Department

Professors Lowe, Swanson; Associate Professors Ohlson, Sutherland; Assistant Professors L'Engle, Lowenberg, Shilling; Instructors Chapin, Diehl, Kirkpatrick; Fellows Armstrong, Young  
Extension Workers Anderson, Cessna, Peterson, Swinney

The department offers a (four-year) curriculum in Foods and Nutrition designed to acquaint the student with the principles underlying the selection, preparation and use of foods for maintaining the nutrition of the individual. Opportunity is given for the election of one of four majors, i. e., dietetics, nutrition, experimental cookery, or related science.

The major in dietetics is designed to prepare the student for service as a dietitian in hospitals, colleges, or similar institutions. Following graduation an internship of 12 months must be taken in an approved hospital. Upon completion of this training the student is eligible to membership in the American Dietetic Association.

The major in nutrition is designed to prepare the student for service as a nutrition specialist in social welfare or extension work. Courses in education and animal nutrition are advised for those preparing for extension work; sociology, psychology, and child development for welfare work. For an appointment in social welfare work additional training in case work should be secured under the direction of a qualified social worker.

The major in experimental cookery is designed for the student who desires to enter the business field. Such positions may include food preparation, production and promotion, research for, and direction of Home Economics departments in commercial firms. Courses in journalism, catering, and equipment are optional.

The major in related science is designed to prepare the student for graduate study, research, or appointment as laboratory technician in

foods and nutrition or allied fields. Courses in chemistry, physics, mathematics, and foreign language supplement the home economics courses.

The sequence of courses for Freshmen is the "Uniform Freshman year" for Home Economics students given on page 254.

The sequence of courses for the Sophomore year is uniform for the majors in dietetics, nutrition, and experimental cookery. The electives and options of the Junior and Senior year vary with the major interest of the student.

Transfer students must satisfy the home experience project, F. & N. 207, before registering for advanced courses in foods. Practical examinations for credit in home and previous experience are given once each quarter, following mid-quarter examinations.

### Curriculum In Foods and Nutrition

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

#### SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Food Preparation		Food Preparation		Human Physiology	
F.&N. 204	4	*F.&N. 205	4	Zool. 255	5
Applied Organic		Food Chemistry		Physiol. & Nutr. Chem.	
Chem. 264	5	Chem. 265	5	Chem. 275	5
Principles of Economics		Principles of Economics		Ec. of Consumption	
Ec. 211	3	Ec. 212	3	Ec. 213	3
Costume Design		House Planning		Interior House Design	
T.&C. 144	3	A.A. 260	2	A.A. 264	3
		Early 19th Century	3		
		Engl. 254 or			
		†Technical Journalism			
		T.Jl. 225B			
Physical Education		Physical Education		Physical Education	
Phys.Ed. 221	R	Phys.Ed. 222	R	Phys.Ed. 223	1**
	15		17		17

\*Home Experience, F.&N. 207, required upon completion of F.&N. 205. See page 263.

\*\*One credit is given upon the completion of three quarters' work.

†Required of those majoring in Nutrition and in Experimental Cookery.

#### MAJOR IN DIETETICS

For Sophomore year, see above.

#### JUNIOR YEAR

Large Quantity Cookery		Meal Planning		Nutrition and Dietetics	
I.Mgt. 380	4	F.&N. 303	4	F.&N. 305	4
Household Bacteriology		Principles of Sociology		Mid-19th Century	3
Bact. 304B	5	Ec. 384	3	Engl. 255 or	
American Government		General Psychology		**Electives in English	
Govt. 315	3	Psych. 204	3	Extempore Speaking	
Accounting		Clothing		P.S. 311	3
Ec. 374	4	T.&C. 224	3	Child. & Adolescence	
		Electives	3	Psych. 415	3
				Electives	3
	16		16		16

\*\*Students who elect T.Jl. 225B in the Sophomore year take Engl. 254 or 255.

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Experimental Cookery		Art Appreciation		Home Management	
F.&N. 511	3	A.A. 484	3	H.Mgt. 474	3
Child Care and Training		Child Physiology		Home Mgt. House	
C.D. 435	3	Zool. 558	3	H.Mgt. 475	4
Purchasing		Textile Economics		Institution Administration	
I.Mgt. 484	3	T.&C. 464	2	I.Mgt. 587	3
Diet in Disease		Nutrition and Dietetics		Methods for Dietitians	
F.&N. 504	3	F.&N. 404	2	*F.&N. 518	3
Electives	3	Nutrition of Children		Electives	3
		F.&N. 506	3		
		Electives	3		
	<hr/> 15		<hr/> 16		<hr/> 16

\*When possible this course should be preceded by Voc.Ed. 304, credit 3.

## MAJOR IN NUTRITION

For Sophomore year, see page 260.

## JUNIOR YEAR

Meal Planning		Clothing		Nutrition and Dietetics	
F.&N. 303	4	T.&C. 224	3	F.&N. 305	4
Household Bacteriology		Extempore Speaking		Extempore Speaking	
Bact. 304B	5	P.S. 311	3	P.S. 312	3
General Psychology		Principles of Sociology		American Government	
Psych. 204	3	Ec. 384	3	Govt. 315	3
*Electives	3	Mid-19th Century		Textile Economics	
		Engl. 255	3	T.&C. 464	2
		*Electives	3	Feature Writing	
				T.Jl. 335	3
	<hr/> 15		<hr/> 15		<hr/> 15

## SENIOR YEAR

Nutrition and Dietetics		Nutrition of Children		Home Management	
F.&N. 404	2	F.&N. 506	3	H.Mgt. 474	3
Experimental Cookery		Child Care and Training		Home Mgt. House	
F.&N. 511	3	C.D. 435	3	H.Mgt. 475	4
Rural Sociology		Child Physiology		Social Leg. and Problems	
Ec. 386	3	Zool. 558	3	Ec. 588	3
Child. and Adolescence		Art Appreciation		*Electives	6
Psych. 415	3	A.A. 484	3		
*Electives	6	Family Finance			
		Ec. 518	2		
		*Electives	3		
	<hr/> 17		<hr/> 17		<hr/> 16

\*Option: Elect 6 hours from the following: Ec. 385, 515, 517; Voc.Ed. 305; H.Ec.Ed. 406, 517; H.Mgt. 584; Psych. 444, 414, 484; T.Jl. 325, 475.

## MAJOR IN EXPERIMENTAL COOKERY

For Sophomore year, see page 260.

## JUNIOR YEAR

Clothing		Meal Planning		Nutrition & Dietetics	
T.&C. 224	3	F.&N. 303	4	F.&N. 305	4
Household Bacteriology		Large Quantity Cookery		Feature Writing	
Bact. 304B	5	I.Mgt. 380	4	T.Jl. 335	3
General Psychology		Extempore Speaking		Extempore Speaking	
Psych. 204	3	P.S. 311	3	P.S. 312	3
Principles of Sociology		Nineteenth Century		American Government	
Ec. 384	3	Engl. 255	3	Gov. 315	3
*Electives	3	*Electives	3	*Electives	3
	<hr/> 17		<hr/> 17		<hr/> 16

## SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Experimental Cookery F.&N. 511	3	Experimental Cookery F.&N. 512	3	Experimental Cookery F.&N. 518	3
Textile Economics T.&C. 464	2	Art Appreciation A.A. 484	3	Home Management H.Mgt. 474	3
Nutrition and Dietetics F.&N. 404	2	Nutrition of Children F.&N. 506	3	Home Mgt. House H.Mgt. 475	4
Child. & Adolescence Psych. 415	3	Child Care and Training C.D. 485	3	*Electives	5
*Electives	5	Child Physiology Zool. 558	3		
	<hr/> 15		<hr/> 15		<hr/> 15

\*Option: Elect 6 hours from the following: T.Jl. 325, 475; I.Mgt. 486, 580; H.Eq. 485, 521, 522, 523; Chem. 586D.

## MAJOR IN RELATED SCIENCE

For Freshman year see page 254. Chem. 103 instead of Phys. 106.

## SOPHOMORE YEAR

Food Preparation F.&N. 204	4	Food Preparation *F.&N. 205	4	Quantitative Analysis Chem. 213	3
Quantitative Analysis Chem. 211	4	Quantitative Analysis Chem. 212	4	Analytic Geometry Math. 103	5
College Algebra Math. 101	5	Plane Trigonometry Math. 102A	5	General Psychology Psych. 204	3
Human Physiology Zool. 255	5	Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3
				Early 19th Century Engl. 254 or Technical Journalism T.Jl. 225B	} 8
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	
	<hr/> 18		<hr/> 16		<hr/> 18

\*Home Experience, F.&N. 207, required upon the completion of F.&N. 205.

\*\*One credit is given upon the completion of three quarters' work.

## JUNIOR YEAR

Organic Chemistry Chem. 331	4	Organic Chemistry Chem. 332	4	Organic Chemistry Chem. 333	4
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Meal Planning F.&N. 303	4
General Physics Phys. 211	4	General Physics Phys. 212	4	General Physics Phys. 218	4
Ec. of Consumption Ec. 213	3	American Government Govt. 315	3	Child. & Adolescence Psych. 415	3
	<hr/> 15		<hr/> 15		<hr/> 15

## SENIOR YEAR

Physical Chemistry Chem. 321	4	Physical Chemistry Chem. 322	4	Extempore Speaking P.S. 311	3
Physiological Chemistry Chem. 474	3	Experimental Cookery F.&N. 511	3	Child Care and Training C.D. 485	3
†German M.L. 441	3	†German M.L. 442	3	†German M.L. 443	3
Household Bacteriology Bact. 304B	5	Nutrition and Dietetics F.&N. 305	4	Seminar F.&N. 404	2
		Textile Economics T.&C. 464	2	Art Appreciation A.A. 484	3
	<hr/> 15		<hr/> 16	Electives	2
					<hr/> 16

†An elective may be substituted if approved by the head of the department.

## Description of Courses

204, 205. **Food Preparation.** Composition, selection, and preparation of food; factors of cookery; analysis of recipes and standard products. (204) Prerequisite: Chem. 106. Fall, Winter, Spring. (205) Prerequisite: 204. Fall, Winter, Spring. Lect. 1. Rec. 1. Lab. 3, 2 hr. Credit 4 each course.

207. **Home Experience.** All students must have, in addition to the prescribed foods subjects, some practical experience before graduation. The home experience project has been designed for this purpose. It should follow F.&N. 205. Completion of the project and the practical examination are prerequisite to registration in Meal Planning, F.&N. 303.

303. **Meal Planning.** The choice, purchase, preparation, and service of food considering dietary standards, food habits and nutritional needs of the group. Prerequisite: 205 or 304, 207 and Home Experience examination. Lect. and lab. 3, 3 hr. Credit 4. Fall, Winter, Spring.

304. **Advanced Food Preparation.** Factors affecting the preparation of standard food products from the experimental viewpoint. Prerequisite: 205 or 207. Fall, Winter, Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

305. **Nutrition and Dietetics.** Principles of normal human nutrition. Application of practical feeding problems of the individual. Calculation and preparation of dietaries. Prerequisite: 303, Bact. 304B, Chem. 274 or 275, and Zool. 255. Fall, Winter, Spring. Lect. 3. Lab. 1, 3 hr. Credit 4.

404. **Seminar in Nutrition and Dietetics.** Prerequisite: 305. Fall, Winter, Spring. Rec. 2. Credit 2.

406. **Fundamentals of Food Selection and Preparation.** Principles of cookery, meal planning and preparation adapted to forestry, engineering, scout camps, and organized houses. Open to men. Spring. Lab. 1, 3 hr. Credit 1.

504. **Diet in Disease.** Impaired digestive or metabolic conditions and dietetic treatment. Prerequisite: 305. Fall, Winter. Rec. 2. Lab. 1, 3 hr. Credit 3. Miss Ohlson.

506. **Nutrition of Children.** Infant feeding, development of food habits, dietary standards, food requirements of various ages and indices of nutrition. Prerequisite: 305. Fall, Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3. Miss Lowenberg.

507. **Special Topics.** Prerequisite: 305. Fall, Winter, Spring. Misses Nelson, Swanson, Ohlson, Lowe.

511, 512, 513. **Experimental Cookery.** (511) Egg cookery; emulsions; jelly; heat penetration; batters and doughs. Prerequisite: 205, and Chem. 265. Fall, Winter, Spring. (512) Fats and oils; meats; gelatin and milk. Prerequisite: 511. Winter, Spring. (513) Individual problems. Prerequisite: 511. Fall, Winter, Spring. (511, 512) Rec. 1. Lab. 2, 3 hr. Credit 3 each course. (513) Credit and hours as arranged. Miss Lowe.

518. **Methods of Teaching Hospital Dietetics.** Objectives, technics, and organization of subject matter in dietetics and nutrition for teaching medical and dietitian internes, student nurses, and patients in hospitals. Prerequisite: 504. Winter, Spring. Rec. 3. Credit 3. Miss Ohlson.

606, 607. **Laboratory Methods in Nutrition.** (606) Emphasis on nitrogen, calcium, iron, and phosphorus determinations. Prerequisite: 305, and classification in Chem. 474. Fall. Lect and lab. 3, 3 hr. Credit 4. (607). Biological assay of foods. Prerequisite: 305, and classification in Chem. 474. Fall, Lect. 1. Lab. 2, 3 hr. Credit 3. Miss Swanson.

609. **Seminar.** Fall, Miss Nelson. Winter, Miss Swanson. Spring, Miss Lowe.

614. **Research.** (A) Nutrition. (B) Foods. Misses Nelson, Swanson, Lowe, Ohlson.

615, 616. **Advanced Nutrition and Dietetics.** Recent developments in nutrition with selected problems. (615) Prerequisite: 609. Winter. (616) Prerequisite: 615. Spring. Credit 3, each course. Miss Swanson.

## HOME ECONOMICS EDUCATION

(Administered jointly by the Home Economics Division and the Department of Vocational Education.)

CORA B. MILLER, Head of Department

Associate Professors Friant, Turner; Assistant Professors Chadderdon, Hunter, \*Lyle, Olson; Instructor McCloskey; Graduate Assistant Pate

\*Absent on leave.

The work in this department is planned to meet the state requirement in education, psychology, and home economics for a teacher's standard secondary certificate in Iowa. Opportunity is offered for supervised teaching in Home Economics in typical Iowa schools.

The standard secondary certificate requires, in addition to the major subject, the completion of at least 15 quarter credits in each of two additional subject matter fields.

The following subjects, in addition to those required for all students in the department, are suggested for those desiring to be recommended for teaching in the specified fields.

English: 254, 255, 205 or 304, 394.

History: 534, 564.

Mathematics: 101, 102A, 103, 300, 497.

General Science—Botany: 101, 103, Geol. 201.

Students who wish to teach home economics should elect this curriculum.

### Curriculum In Home Economics Education

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

#### SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Human Physiology		Food Preparation		Food Preparation	
Zool. 255	5	F.&N. 204	4	F.&N. 205	4
Applied Organic		Food Chemistry		Physiol. and Nutr. Chem.	
Chem. 264	5	Chem. 266	3	Chem. 274	3
Principles of Economics		Principles of Economics		Ec. of Consumption	
Ec. 211	3	Ec. 212	3	Ec. 213	3
Costume Design		House Planning		Interior House Design	
T.&C. 144	3	A.A. 260	2	A.A. 264	3
		Clothing		General Psychology	
Physical Education		T.&C. 224	3	Psych. 204	3
Phys.Ed. 221	R	Physical Education		Physical Education	
		Phys.Ed. 222	R	Phys.Ed. 223	1*
	16		15		17

#### JUNIOR YEAR

Household Bacteriology		American Government		Dietetics	
Bact. 304B	5	Govt. 315	3	F.&N. 305	4
Advanced Clothing		Meal Planning		Principles of Sociology	
T.&C. 324	4	F.&N. 303	4	Ec. 384	3
Educational Psychology		Child. & Adolescence		Child Care and Training	
Psych. 334	3	Psych. 415	3	C.D. 435	3
Principles of Education		Meth. of Teach. Voc. Subj.		Meth. of Teaching H.Ec.	
Voc.Ed. 304	3	Voc.Ed. 305	4	H.Ec.Ed. 406	4
		Electives	3	Electives	3
	15		17		17

#### SENIOR YEAR

Supervised Teaching		Home Management		Princ. of Sec. Education	
H.Ec.Ed. 407	4	H.Mgt. 474	3	Voc.Ed. 306	3
Textile Economics		Home Mgt. House		World Literature	
T.&C. 464	2	H.Mgt. 475	4	Engl. 354 or	
Extempore Speaking		Amer. Masterpieces		Drama	
P.S. 311	3	Engl. 364 or	3	Engl. 464	
Art Appreciation		Technical Journalism		Adv. Child Care & Train.	
A.A. 484	3	T.Jl. 225B	6	C.D. 536	3
Electives	4	Electives	6	Electives	6
	16		16		15

\*One credit will be given upon the completion of three quarters' work.



### Vocational Certificate

The department is approved by the Federal Board for Vocational Education for the training of teachers of Homemaking. Students who desire to teach in the federally aided schools of the state must complete the curriculum in Home Economics Education, plus the following subjects:

Home Economics Education 508	3 cr.
Home Economics Education 528	3 cr.
Home Experience (consult counselor)	R
	<hr/>
	6 cr.

### Extension Major

Mature students who are interested in receiving training which will prepare them for work in the Extension field are advised to add to the curriculum in Home Economics and Education, courses in Rural Sociology, Rural Community Organization, Journalism, Public Speaking, and Methods in Extension.

### Description of Courses

**406. Methods of Teaching Home Economics.** (Voc. Ed. 406.) Objectives for home economics courses in high school. Selection of problems for realizing objectives. Methods of presenting problems. Uses of objective material. Directed observation and participation in teaching. Prerequisite: Voc. Ed. 305, and completion of two quarters of junior year. Rec. 3. Lab. 1, as arranged. Credit 4.

**407. Supervised Teaching in Home Economics.** (Voc. Ed. 407.) Supervised teaching in public schools having co-operative agreement. Prerequisite: Credit or classification in 406. Fall, Winter, Spring. Labs. as arranged. Credit 4.

**504. Special Topics in Home Economics Education.** (Voc. Ed. 504.) Prerequisite: 406. Miss Miller.

**506. Teaching Human Relationships in the Public Schools.** (Voc. Ed. 506.) Objectives, selection of material, and problem organization of courses in human relationships, including family and community relationships, child care, and personality development. Prerequisite: 407, C.D. 435, H. Mgt. 474, or equivalent. Rec. 6. Credit 3. Summer, second term. Miss Turner.

**508. Methods of Teaching Adult Homemaking Classes.** (Voc. Ed. 508.) Place of Home Economics in the adult program. Organization of adult classes. Planning units of work. Observation of adult classes. Prerequisite: credit or classification in 406. Winter, Spring. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3. Miss Lyle.

**509. The Home Economics Movement.** (Voc. Ed. 509) The development of home economics in relation to the education of women. Reports of present day fields in which home economics is active. Spring. Rec. 2. Credit 2. Miss Fisher.

**517. Methods in Extension and Home Demonstration Work.** Organization of home demonstration work as conducted in Iowa. Observation of various types of work with rural women and 4-H Club girls. Prerequisite: 406. Alternate years. Offered Spring, 1938. Rec. 1. Lab. 2 as arranged. Credit 3. Mrs. Ellis.

**528. Methods for Vocational Teachers.** (Voc. Ed. 528.) Philosophy of Vocational Education. Home projects. Teaching of related subjects. Prerequisite: Voc. Ed. 305. Winter, Spring. Rec. 3. Credit 3. Miss Chadderdon.

**605. Home Economics Curricula.** (Voc. Ed. 605.) Survey of public school home economics curricula and recent curriculum studies. Techniques of curriculum building. Objectives and problems for specific courses. Prerequisite: credit or classification in Voc. Ed. 562. Spring. Rec. 3. Credit 3. Miss Turner.

**606. Technique of Supervision.** (Voc. Ed. 606.) Objectives, techniques, and organization of teacher training supervision and state supervision. Prerequisite: 407 or equivalent. Spring. Credit 3 to 6. Miss Friant.

**607. Survey Course in Methods of Teaching Home Economics in the Public Schools.** (Voc. Ed. 607.) Investigation and reports of present day trends in methods of teaching home economics. Prerequisite: teaching experience Summer, first term. Rec. 5. Credit 2. Miss Miller.

**610. Seminar.** (Voc. Ed. 610.) Credit and hours as arranged. Miss Friant.

**614. Research.** (Voc. Ed. 614) Misses Miller, Friant, Turner, Chadderdon.

HOME MANAGEMENT

PAULENA NICKELL, Head of Department

Professor Hoyt; Graduate Assistants Ferguson, McKinney, Zwemer  
Extension Workers Gannon, Simmons, Simpson

The purpose of the Home Management curriculum is to give the student an appreciation of the value of good management in the various phases of home life. It offers to those who do not wish to specialize in any one field of Home Economics, a more general training. Class work and residence in one of the home management houses give opportunity for gaining some experience with the managerial and social problems of the home and the care of a child in a home situation. Special provision is made by the department for the mature student who wishes to prepare for a teaching position in Home Management.

Curriculum In Home Management

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Applied Organic		Food Chemistry		Human Physiology	
Chem. 264	5	Chem. 266	3	Zool. 255	5
Principles of Economics		Principles of Economics		Ec. of Consumption	
Ec. 211	3	Ec. 212	3	Ec. 213	3
Costume Design		Food Preparation		Food Preparation	
T.&C. 144	3	F.&N. 204	4	F.&N. 205	4
General Psychology		Clothing		Early 19th Century	3
Psych. 204	3	T.&C. 224	3	Engl. 254 or	
House Planning		Interior House Design		Technical Journalism	
A.A. 260	2	A.A. 264	3	T.Jl. 225B	
Physical Education		Physical Education		Physical Education	
Phys.Ed. 221	R	Phys.Ed. 222	R	Phys.Ed. 223	1*
	16		16		16

\*One credit is given upon the completion of three quarters' work.

JUNIOR YEAR

General Bacteriology		Principles of Sociology		Meal Planning	
Bact. 304B	5	Ec. 384	3	F.&N. 303	4
American Government		Advanced Clothing		Art Appreciation	
Govt. 315	3	T.&C. 324	4	A.A. 484	3
Child. and Adolescence		Child Care and Training		Extempore Speaking	
Psych. 415	3	C.D. 435	3	P.S. 311	3
Plan. Home Landscapes		Textile Economics		Electives	6
L.A. 206	2	T.&C. 464	2		
Electives	3	Music Appreciation			
		Music 144	1		
		Electives	3		
	16		16		16

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Home Management		Home Relationships		Physical Development	
H.Mgt. 474	3	H.Mgt. 584	3	C.D. 545	2
Home Mgt. House		Child Physiology		Standards of Living	
H.Mgt. 475	4	†Zool. 558	3	†Ec. 516	3
Household Economics		Family Finances		**Option in English	3
Ec. 514	3	H.Mgt. 518	2	Electives	8
Electives	6	Electives	8		
	<hr/> 16		<hr/> 16		<hr/> 16

\*\*Students who elected T.J.I. 225B in the Sophomore year take Engl. 254 or 255.

†Alternatives in the above sequence are as follows: L.A. 206 or Hort. 146, Home Floriculture; Zool. 558 or F.&N. 506, Nutrition of Children; Ec. 516 or Ec. 515, Consumers Marketing or Ec. 517, Housing. Suggested electives for Home Management Curriculum: Cer.E. 324; Engl. 354 or 404, 414, 455; I.A. 105; T.J.I. 225B or 835; Ec. 885.

For those students especially interested in the economic aspects of Home Management, the following changes are recommended: omit Music 144, C.D. 545, H.Mgt. 584, Zool. 558; and add Ec. 234 or 406, 304 or 505, 515, and H.Mgt. 517.

## Description of Courses

474. General Home Management. The home as it is influenced by training and by expenditure of time, energy, and money; and a consideration of human values. Prerequisite: F.&N. 303, C.D. 435, Ec. 212, 384, and classification in H. Mgt. 475. Fall, Winter, Spring. Rec. 3, 2 hr. periods for six weeks, alternating with 475. Credit 3.

475. Home Management House. Six weeks' residence with actual experience in such phases of homemaking as food preparation, purchasing, meal planning and serving, child care, housekeeping, household finance, hospitality, and group relationships. Prerequisite: classification in 474. Reservation required previous to beginning of quarter. Fall, Winter, Spring. Credit 4 for six weeks' residence.

517. Housing. (Ec. 517.) Expenditures, factors affecting demand for and supply of housing, regulations pertaining to housing, house ownership, organization promoting better housing. Prerequisite: Ec. 212. Spring. Rec. 3. Credit 3. Miss Reid.

518. Family Finance. (Ec. 518.) Earning and spending income to increase its adequacy and insure economic security; budgeting, accounting, consumer credit, investments, control of property. Prerequisite: Ec. 212. Winter, Spring. Rec. 2. Credit 2. Miss Reid.

579. Special Topics. Prerequisite: 475. Fall, Winter, Spring. Miss Nickell.

584. Home Relationships. Relationships among family members and present day influences affecting them. Prerequisite: 474, or consent of head of department. Rec. 3. Credit 3. Winter. Miss Nickell, Miss Hoyt, Mr. Vance.

614. Research. Misses Hoyt, Nickell, Reid.

677. Seminar. Winter. Miss Hoyt.

684. Supervision. Organization, supervision and methods of conducting Home Management Houses. Prerequisite: 475. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3. Miss Nickell.

## HOUSEHOLD EQUIPMENT

LOUISE J. PEET, Head of Department

Associate Professor Brashear; Assistant Professor Sater

The field of household equipment is one of the newer developments of home economics. Beginning as a general subject which aimed to give an understanding of the principles and techniques which the homemaker should know about the selection, operation, care, and convenient arrangement of equipment in the house, it has grown to a curriculum pre-

paring for both the professional and commercial fields. There is an increasing demand for trained women as home economic directors in firms manufacturing household equipment; home service directors in gas and electric companies; research workers in college and commercial laboratories; college teachers; and extension workers.

### Curriculum In Household Equipment

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

#### SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Applied Organic Chem. 264	5	Food Chemistry Chem. 265	5	Physiol. & Nutritional Chem. Chem. 274	3
Food Preparation F.&N. 204	4	Food Preparation F.&N. 205	4	House Planning A.A. 260	2
General Physics Phys. 301	4	General Physics Phys. 302	4	General Physics Phys. 303	4
Costume Design T.&C. 144	3	Nineteenth Century Engl. 254 or 255	3	General Psychology Psych. 204	3
				Technical Journalism T.Jl. 225B	3
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
	<u>16</u>		<u>16</u>		<u>16</u>

\*One credit is given upon the completion of three quarters' work.

#### JUNIOR YEAR

Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3
Child. & Adolescence Psych. 415	3	Household Bacteriology Bact. 304B	5	Interior House Design A.A. 264	3
Human Physiology Zool. 255	5	Clothing T.&C. 224	3	Meal Planning F.&N. 303	4
Equipment Mechanics H.Eq. 404	3	Equipment Mechanics H.Eq. 405	3	Principles of Sociology Ec. 384	3
Electives	3	Electives	3	Electives	3
	<u>17</u>		<u>17</u>		<u>16</u>

#### SENIOR YEAR

Nutrition and Dietetics F.&N. 305	4	Textile Economics T.&C. 464	2	Seminar H.Eq. 425	2
Art Appreciation A.A. 484	3	Child Care and Training C.D. 435	3	Home Management H.Mgt. 474	3
Experimental Cookery F.&N. 511	3	American Government Govt. 315	3	Home Mgt. House H.Mgt. 475	4
Elective in H.Eq.	3	Extempore Speaking P.S. 311	3	Electives	6
Electives	3	Electives	4		
	<u>16</u>		<u>15</u>		<u>15</u>

Since the curriculum in household equipment is designed to prepare the student for commercial and professional appointments, 10-15 credits are to be selected in conference with the head of the department. Sub-

jects suggested as essential for students desiring commercial positions in equipment are business correspondence, technical advertising, feature writing, public speaking, catering, and business psychology.

### Description of Courses

154. **Fundamentals of Household Equipment.** Prerequisite: Phys. 106 or equivalent. Fall, Winter, Spring. Lect. and lab. 3, 2 hr. Credit 3.

338. **Technics of Demonstration.** Selection and organization of suitable material, and practice in broadcasting and demonstrating. Open to students not majoring in household equipment. Prerequisite: F.&N. 303. Summer, first term. Rec. 2. Lab. 4, 3 hr. Credit 3.

404, 405. **Equipment Mechanics.** Fundamentals of electricity and of heat. Simple circuits. Operation and use of laboratory testing and measuring instruments; materials used in equipment construction; thermostats. (404) Prerequisite: 154 and credit or classification in Phys. 301, 302, or 303. (405) Prerequisite: 404. Fall, Winter, respectively. Lect. 1. Lab. 2, 3 hr. Credit 3 each course.

425. **Seminar.** Recent developments in the equipment field. Prerequisite: 405. Spring. Rec. 2. Credit 2.

435. **Equipment Testing.** Use of measuring and testing instruments to determine efficiency and cost of operation of gas and electric equipment for institution use. Prerequisite: 154. Fall, Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

506. **Gas and Electric Cooking Appliances.** Construction and efficient operation of ranges and small appliances. Prerequisite: 405. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3. Miss Sater.

507. **Equipment for Cleaning.** Laundry equipment, vacuums, waxers, brushes. Prerequisite: 405, T.&C. 504. Alternate years. Offered Winter, 1938. Lect. 1. Lab. 2, 3 hr. Credit 3. Mrs. Peet.

508. **Non-electric Equipment.** Types on the market, methods of manufacture, factors governing their efficiency. Prerequisite: 404. Alternate years. Offered Winter, 1939. Lect. 1. Lab. 2, 3 hr. Credit 3. Mrs. Peet.

509. **Home Utilities.** Construction and operation of ice and mechanical refrigerators; principles of electric circuits as applied to home wiring; lighting fixtures. Prerequisite: credit or classification in 404. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3. Mrs. Peet.

514. **Special Topics.** Prerequisite: 154. Fall, Winter, Spring. Mrs. Peet, Miss Sater.

521, 522, 523. **Training for Home Service Directors.** Practical experience in Home Service Work. Demonstrations, preparation of publicity material, radio programs, approved business procedure. Prerequisite: 4 credits in advanced equipment. Spring, Fall, Winter, respectively. Conference 1. Lab. 2, 3 hr. Credit 3 each course. Mrs. Peet, Miss Sater.

604. **Seminar.** Fall, Winter, Spring. Mrs. Peet.

614. **Research.** Mrs. Peet.

## INSTITUTION MANAGEMENT

FERN W. GLEISER, Head of Department

Assistant Professor Sullivan; Instructors Anderson, McMullen, Severance, Sheldon; Graduate Assistant Van Cleve; Fellow Davis

The curriculum in Institution Management is planned to prepare students for managerial positions in the field of institutional administration. Graduates of this department fill positions as managers of food and housing departments of clubs, hotels, and college dormitories, and direct the food service in tea rooms, restaurants, cafeterias, school lunch rooms, and college dining halls.

Experience has proved that students completing this curriculum should

plan to serve a period of apprenticeship in an approved institution. An apprenticeship period of from six months to one year under the supervision of an experienced manager should be completed before the graduate accepts a position requiring managerial responsibility. It is suggested that the student spend the summer vacation following the Junior year working in either the food or housing department of an institution.

Training in large quantity food preparation and service is afforded through the Home Economics Tea Room in which luncheon is served to faculty and students, and catering is done for special occasions. The Memorial Union, through the food and room services, offers laboratory experience in management to advanced students

### Curriculum In Institution Management

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

#### SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Food Preparation		Food Preparation		Clothing	
F.&N. 204	4	F.&N. 205	4	T.&C. 224	3
Applied Organic		Food Chemistry		Physiol. & Nutr. Chem.	
Chem. 264	5	Chem. 265	5	Chem. 274	3
Costume Design		House Planning		Interior House Design	
T.&C. 144	3	A.A. 260	2	A.A. 264	3
Nineteenth Century		General Psychology		Principles of Economics	
Engl. 254 or 255	3	Psych. 204	3	Ec. 211	3
		Technical Journalism		Extempore Speaking	
		T.Jl. 225B	3	P.S. 311	3
Physical Education		Physical Education		Physical Education	
Phys.Ed. 221	R	Phys.Ed. 222	R	Phys.Ed. 223	1*
	<u>15</u>		<u>17</u>		<u>16</u>

\*One credit will be given upon the completion of three quarters' work.

#### JUNIOR YEAR

Principles of Economics		Ec. of Consumption		American Government	
Ec. 212	3	Ec. 213	3	Govt. 315	3
Human Physiology		Large Quantity Cookery		Equipment Testing	
Zool. 255	5	I.Mgt. 380	4	H.Eq. 485	3
General Bacteriology		Meal Planning		Nutrition and Dietetics	
Bact. 304B	5	F.&N. 303	4	F.&N. 305	4
Electives	3	Textile Economics		Child. & Adolescence	
		T.&C. 464	2	Psych. 415	3
		Electives	3	Electives	3
	<u>16</u>		<u>16</u>		<u>16</u>

#### SENIOR YEAR

Purchasing		Institution Equipment		Institution Administration	
I.Mgt. 484	3	I.Mgt. 485	3	I.Mgt. 587	3
Accounting		Catering		In. Mgt. Practice	
Ec. 374	4	I.Mgt. 486	3	I.Mgt. 586	3
Experimental Cookery		Home Management		Principles of Sociology	
F.&N. 511	3	H.Mgt. 474	3	Ec. 384	3
Child Care and Training		Home Mgt. House		Art Appreciation	
C.D. 435	3	H.Mgt. 475	4	A.A. 484	3
Electives	3	Electives	3	Business English	
				Engl. 404	2
				Electives	2
	<u>16</u>		<u>16</u>		<u>16</u>

Students who plan to engage in commercial food service are advised to elect Experimental Cookery, F. & N. 512; Industrial Psychology, Psych. 464; Training for Home Service Directors, H. Eq. 521; Farm Meats, A.H. 374.

Students whose major interest is the administration of a hospital dietary department should major in Foods and Nutrition and elect I. Mgt. 380, 484, 485, and 587.

Mature students interested in the management of college residences and dining halls are advised to elect Experimental Cookery, F.&N. 512; Diet in Disease, F.&N. 504; Training for Home Service Directors, H. Eq. 521; Gas and Electric Cooking Appliances, H. Eq. 506; and further work in Economics and Psychology. If the student plans to teach institution management, she should elect Methods of Teaching College Subjects, Voc. Ed. 561, 562, 563.

### Description of Courses

380. **Large Quantity Cookery.** Standard methods of food production in quantity; menu planning for institutions; food cost accounting; experience in food service. Prerequisite: F.&N. 207. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

484. **Purchasing.** Factors determining the selection of foods and general supplies. Methods of buying. Prerequisite: 380. Fall. Rec. 2. Lab. and rec. 1, 2 hr. Credit 3.

485. **Institution Equipment.** Selection, arrangement and care of equipment and furnishings for the food and housing department. Prerequisite: 380, H. Eq. 435. Winter. Rec. 2. Lab. and rec. 1, 2 hr. Credit 3.

486. **Catering.** Food preparation and service for special occasions. History of cookery. Contribution of foreign nations to the American cookery of today. Prerequisite: 380, credit or classification in F.&N. 303. Fall, Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

580. **Experimental Quantity Cookery.** Methods in quantity food production as related to the time factor, institution equipment, and proportions of ingredients. Prerequisite: 380, F.&N. 511. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3. Miss Gleiser.

586. **Institution Management Practice.** Experience in the food service and housing departments of the Memorial Union and Co-operative Dormitories. Prerequisite: 484, 485, 486. Winter, Spring. Lect. 1. Lab. 2, 3 hr. Credit 3. Miss Gleiser.

587. **Institution Administration.** Principles of scientific management applied to institutional administration. Emphasis on forms of business organization, employer and employee relationship, and keeping of records. Prerequisite: 484 or 485. Spring. Rec. 3. Credit 3. Miss Gleiser.

588. **Special Topics.** Prerequisite: 484, 485. Fall, Winter, Spring. Miss Gleiser.

604. **Seminar.** Miss Gleiser.

614. **Research.** Miss Gleiser.

### TEXTILES AND CLOTHING

ROSALIE RATHBONE, Head of Department

Professors Brandt, Cranor, Sims; Associate Professors Settles, Stephens; Assistant Professor Potgieter; Instructors Buchanan, Gabrielson, Gustafson, Meyer; Extension Workers Adams, Peterson, Wood

The department offers courses designed to furnish such knowledge and training as is essential to the consumer for satisfactorily providing clothing and household fabrics, for the individual, the family, and the home.

Advanced work is also offered to provide fundamental information and training in textiles and clothing for those who wish to go into merchandising or other commercial positions which involve work in textiles, clothing, costume design, or fashion.

The curriculum in Textiles and Textile Chemistry is designed for those who wish to prepare to work in textile laboratories or to do research in textiles.

### Curriculum In Textiles and Clothing

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

#### SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Applied Organic Chem. 264	5	General Psychology Psych. 204	3	Ec. of Consumption Ec. 213	3
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Textile Analysis Chem. 268	5
Drawing and Composition A.A. 221	2	Drawing and Composition A.A. 222	2	Food Preparation F.&N. 205	4
Costume Design T.&C. 144	3	Clothing T.&C. 224	3	Interior House Design A.A. 264	3
Early 19th Century Engl. 254	3	Food Preparation F.&N. 204	4		
		House Planning A.A. 260	2		
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
	16		17		16

\*One credit will be given upon the completion of three quarters' work.

#### JUNIOR YEAR

Meal Planning F.&N. 303	4	Household Bacteriology Bact. 304B	5	Child Care and Training C.D. 485	3
Child. and Adolescence Psych. 415	3	American Government Govt. 315	3	Option in English	3
Advanced Clothing T.&C. 324	4	Costume Design T.&C. 444	3	Principles of Sociology Ec. 384	3
Advanced Textiles T.&C. 504	3	Textile Design A.A. 434	3	Adv. Composition Engl. 304 or Technical Journalism T.Jl. 225B	3
*Electives	3	*Electives	3	*Electives	3
	17		17		15

#### SENIOR YEAR

Art Appreciation A.A. 484	3	Home Management H.Mgt. 474	3	Extempore Speaking P.S. 311	3
History of Costume T.&C. 554	3	Home Mgt. House H.Mgt. 475	4	Applied Dress Design T.&C. 525	3
Textile Economics T.&C. 464	2	Historic Textiles T.&C. 514	3	Costume Design T.&C. 544	3
Applied Dress Design T.&C. 524	3			Textile Economics T.&C. 565	2
*Electives	5	*Electives	5	*Electives	4
	16		15		15

\*Nine credit hours of electives must be chosen from the major or closely related departments.



## Curriculum In Textiles and Textile Chemistry

Students who wish to prepare to teach textiles, to do research in textiles, or to work in textile laboratories may arrange with the head of the department to follow a curriculum in Textiles and Textile Chemistry. This curriculum will be built on the uniform freshman year as outlined on page 254. Beginning with the sophomore year a special curriculum will be followed.

### Description of Courses

**104. General Textiles.** Fundamental weaves, yarns, fibres, color, and finishes with reference to selection of fabrics for clothing and house. Fall, Winter, Spring. Lect. and lab. 3, 2 hr. Credit 3.

**144. Costume Design.** The essentials of designing and selection of costumes for the individual. Based on personal design, line, color, individual and figure problem. Prerequisite: A.A. 105. Fall, Winter, Spring. Lect. and lab. 3, 2 hr. Credit 3.

**224. Clothing.** Designing and making patterns of dress and details by modeling and draping; fitting and construction to evaluate individual sewing skills. Prerequisite: 144. Fall, Winter, Spring. Lab. 3, 3 hr. Credit 3.

**225. Independent Work.** Students will be required to plan and complete a clothing problem after the completion of 224 and pass an examination before registration in 324.

**324. Advanced Clothing.** Development of the foundation pattern; flat pattern designing and the selection and construction of a wool garment. Prerequisite: 224, 225. Fall, Winter, Spring. Lect. and lab. 3, 3 hr. Credit 4.

**444. Costume Design.** Creative problems based on source material commonly used in designing clothing. Prerequisite: 224. Fall, Winter. Lect. and lab. 3, 2 hr. Credit 3.

**464. Textile Economics.** Economic phases of the production and distribution of textile and clothing commodities which directly or indirectly affect the consumer. Prerequisite: 104, 224, Ec. 213. Fall, Winter, Spring. Rec. 2. Credit 2.

**490. Special Problems.** Prerequisite: 324. Fall, Winter, Spring.

**504. Advanced Textiles.** Specific studies of different groups of clothing and household textiles in relation to modern practical needs. Prerequisite: 104 and classification in 324, or equivalent. Fall, Winter. Lect. and lab. 3, 2 hr. Credit 3. Miss Settles.

**514. Historic Textiles.** Development of textiles from ancient times; existing sources, comparison with modern commercial products. Development of appreciation with reference to materials, old and new. Prerequisite: 104, Hist. 213. Winter, Spring. Lect. and lab. 3, 2 hr. Credit 3. Miss Settles.

**524, 525. Applied Dress Design.** (524) Draping and modeling dresses of original designs with emphasis upon the technique of the handling of different fabrics and the finishing techniques. Prerequisite: 324, 444. Fall, Winter. Lect. and lab. 3, 3 hr. Credit 3. Miss Rathbone, Miss Potgieter. (525) Pattern requirements of designs in different materials and different types of costumes. Prerequisite: 524. Spring. Lect. and lab. 2, 3 hr. Credit 3. Miss Potgieter, Miss Cranor.

**526. Children's Clothing.** Selection and construction of suitable clothing for children. Prerequisite: 324. Winter, Spring. Lect. and lab. 2, 3 hr. Credit 3. Miss Potgieter, Miss Brandt.

**527. Tailoring.** Tailored construction applied in the making of coats and suits. Prerequisite: 324. Winter. Lab. 2, 3 hr. Credit 2. Miss Stephens.

**544. Costume Design.** Selection and creative work in ensemble building with emphasis upon detail. Prerequisite: 444, 524, 554. Spring. Lect. and lab. 3, 2 hr. Credit 3. Miss Rathbone.

**545. Costume Selection.** Selection of ready-to-wear clothing and accessories, with emphasis on appropriate use and value. Prerequisite: 464. Spring. Lect. and lab. 2, 2 hr. Credit 2. Miss Rathbone.

**554. History of Costume.** Prerequisite: History 213. Fall. Lect. 3. Credit 3. Miss Potgieter.

**565. Textile Economics.** Prerequisite: 464. Spring. Credit 2. Miss Sims.

590. **Special Topics.** Prerequisite: 324. Fall, Winter, Spring. Credit 2 to 4. Misses Brandt, Settles, Cranor, Rathbone.

610. **Seminar.** Fall, Winter, Spring. Miss Rathbone, Miss Cranor.

614. **Research.** Misses Rathbone, Cranor, Brandt, Settles.

### Curriculum In Home Economics with Major In Technical Journalism

A variety of positions is open to women with combined training in home economics and technical journalism. Such positions fall into two classes, editorial and advertising. The first class includes editorial work or free lance writing for women's magazines, farm journals, daily papers and syndicates. The second class includes advertising and publicity positions with magazines and with industries associated with the home.

Students in home economics with a major in technical journalism have opportunity for practical experience through work on campus publications including The Iowa Homemaker, published by home economics students. Many young women also lay a foundation for active careers by contributing to magazines and newspapers during their training.

Leading to the degree of Bachelor of Science.

For Freshman year, see page 254.

For Technical Journalism, see page 314.

#### SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Food Preparation		Costume Design		Food Preparation	
F & N. 204	4	T & C. 144	3	F & N. 205	4
Applied Organic		Food Chemistry		General Psychology	
Chem. 264	5	Chem. 266	3	Psych. 204	3
Principles of Economics		Principles of Economics		Ec. of Consumption	
Ec. 211	3	Ec. 212	3	Ec. 213	3
Electives	3	Clothing		Early 19th Century	
		T & C. 224	3	Engl. 254	3
		House Planning		Interior House Design	
		A.A. 260	2	A.A. 264	3
Physical Education		Physical Education		Physical Education	
Phys.Ed. 221	R	Phys.Ed. 222	R	Phys.Ed. 223	1*
	<u>15</u>		<u>15</u>		<u>16</u>

\*One credit will be given upon the completion of three quarters' work.

#### JUNIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Technical Writing		Technical Writing		Technical Writing	
T.Jl. 221	4	T.Jl. 222	4	T.Jl. 223	4
General Bacteriology		Principles of Sociology		Child Care and Training	
Bact. 304B	5	Ec. 384	3	C.D. 485	3
		Child Psychology		Meal Planning	
		Psych. 415	3	F & N. 303	4
		American Government		Extempore Speaking	
		Govt. 315	3	P.S. 811	3
Electives	6	Electives	3	Electives	3
	<u>15</u>		<u>16</u>		<u>17</u>

## SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Technical Writing T.Jl. 321	3	Technical Writing T.Jl. 322	3	Art Appreciation A.A. 484	3
Practice Copy Editing T.Jl. 341	2	Practice Copy Editing T.Jl. 342	2	Practice Copy Editing T.Jl. 343	2
Home Management H.Mgt. 474	3			Textile Economics T.&C. 464	2
Home Mgt. House H.Mgt. 475	4				
Electives	5	Electives	12	Electives	9
	<u>17</u>		<u>17</u>		<u>16</u>

## HORTICULTURE AND FORESTRY

*For information concerning the Division of Agriculture, see page 120.*

This department includes these major lines of work:

FORESTRY. See page 239.

HORTICULTURE. See below.

## HORTICULTURE

B. S. PICKETT, Head of Department

Professors Erwin, Maney, Richey, Volz; Associate Professors Haber, Nichols, Schilleter; Assistant Professors Lantz, Plagge; Extension Workers, Fitch, Holsinger, Edgecombe, Wingert

It is the aim to teach in a logical way the fundamental principles underlying horticultural practice, supplement this freely with demonstrations, and bring the student into contact with the practical operations. The technical courses are well supported by work in fundamental science and cultural courses.

Directly connected with the campus are orchards, nurseries, vineyards, and gardens. The department has a well equipped plant laboratory building together with greenhouses having over 30,000 feet under glass. Thus the department is able to furnish good opportunities for the student in horticulture to become acquainted with various horticultural operations as carried on under glass and in the field.

There are good openings for horticultural graduates in fruit growing, truck farming, floriculture, managing and superintending commercial fruit, flower, and vegetable establishments. Positions are also open for managers of co-operative associations, for teachers in colleges, academies, and high schools, and for extension experts in agricultural colleges, railroads, land companies, and horticultural associations. Government and experiment station lines of work also afford desirable employment.

## Curriculum In Horticulture

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

## FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Horticulture		Greenhouse Management		Vegetable Growing	
Hort. 114 <sup>1</sup>	3	Hort. 154	3	Hort. 164B	3
General Botany		General Botany		Systematic Botany	
Bot. 101	3	Bot. 102	3	Bot. 206	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101	4	Chem. 102	4	Chem. 103	4
*Livestock Problems		Mathematics		*Livestock Problems	
A.H. 101	2	Math. 205	4	A.H. 103	2
Military 121	1	Military 122	1	Military 123	1
	<hr/> 16		<hr/> 18		<hr/> 17

\*Students in Floriculture and Nursery Management may substitute for courses in Animal Husbandry.

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Hort. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 177.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

Principles of Economics		Principles of Economics		Grapes and Small Fruits	
Ec. 201	3	Ec. 202	3	Hort. 224	4
Plant Physiology		Plant Propagation		Garden Flowers	
Bot. 205	4	Hort. 214	3	Hort. 244	3
Soils		Fertility and Fertilizers		Farm Dairying	
Soils 254	3	Soils 354	5	D.L. 114	4
Organic and Quantitative		Applied Organic		Extempore Speaking	
Chem. 255	3	Chem. 258	2	P.S. 311	2
Crop Production		Gen. Landscape Design		Physics	
F.C. 104	4	L.A. 208	3	Phys. 204	3
Military 221	1	Military 222	1	Military 223	1
	<hr/> 18		<hr/> 17		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

At the beginning of the Junior year, the student must choose a major in Pomology, Floriculture, Nursery Management, or Vegetable Crops. For Majors see page 277.

Orcharding		Orcharding		Orcharding	
Hort. 521	3	Hort. 522	3	Hort. 523	3
Economic History		Commercial Veg. Crops		American Government	
Hist. 324	3	Hort. 366	3	Govt. 815	3
General Genetics		General Bacteriology		Plant Pathology	
Gen. 800	3	Bact. 804A	5	Bot. 207	4
Genetics Laboratory		Elementary Accounting		Plant Materials	
Gen. 305	1	Ec. 370	3	L.A. 232	3
Elementary Entomology		Plant Materials			
Zool. 274	4	L.A. 231	2		
Electives	3			Electives	4
	<hr/> 17		<hr/> 16		<hr/> 17

## SENIOR YEAR

Seminar		Seminar		Seminar	
Hort. 401	1	Hort. 402	1	Hort. 403	1
Horticultural Problems		Horticultural Problems		Horticultural Problems	
Hort. 411	2	Hort. 412	2	Hort. 413	2
Elective in English	3	History & Lit. of Hort.			
		Hort. 514	3		
Electives	11	Electives	11	Electives	14
	<hr/> 17		<hr/> 17		<hr/> 17

**Majors in Horticulture\*****POMOLOGY**

Students desiring to major in Pomology are required to take the following courses during their Junior and Senior years: Marketing Horticultural Products, Hort. 414, 3 credits; Systematic Pomology, Hort. 524, 3 credits; Exotic Fruits, Hort. 424, 2 credits; Fruit Farm Management, Hort. 426, 3 credits; Inspection Tours, Hort. 301, required; Fruit Pests, Zool. 375, 5 credits; Commercial Floriculture, Hort. 546, 3 credits.

**FLORICULTURE**

Students desiring to major in Floriculture are required to take the following courses during their Junior and Senior years: Greenhouse Construction, Hort. 246, credit 3; Commercial Floriculture, Hort. 546 and 547, 6 credits; Floriculture Practice, Hort. 341, 342 and 343, 3 credits; Conservatory Plants, Hort. 444, 3 credits; Floral Arrangement, Hort. 344, 3 credits; Vegetable Forcing, Hort. 468 and 469, 4 credits; Greenhouse Pests, Zool. 378, 2 credits; Inspection Tours, Hort. 301, required.

**VEGETABLE CROPS**

Students desiring to major in Vegetable Crops are required to take the following courses during their Junior and Senior years: Systematic Oleiculture, Hort. 464, 3 credits; Vegetable Crops Practice, Hort. 364 and 365, 2 credits; Inspection Tours, Hort. 301, required; Marketing Horticultural Products, Hort. 414, 3 credits; Vegetable Forcing, Hort. 468 and 469, 3 credits; Commercial Floriculture, Hort. 546, 3 credits; Greenhouse Pests, Zool. 378, 2 credits.

**NURSERY MANAGEMENT**

Students desiring to major in Nursery Management are required to take the following courses during their Junior and Senior years: Advanced Systematic Horticulture, Hort. 525, 526, 527, credit 9; Nursery Methods, Hort. 316, credit 3; Garden Maintenance, Hort. 315, credit 3; Plant Materials, L.A. 333, credit 3; Money and Banking, Ec. 304, credit 3; Business Law, Ec. 365, credit 3.

**Description of Courses**

110. **Introduction to Horticulture.** To acquaint first year students with the field of horticulture and to assist them in learning how to use the facilities of the College and the department to advantage. Spring. Lect. 1. Required.

114. **General Horticulture.** For Agricultural students. A discussion of the field of horticulture, limiting factors in production of horticultural crops; propagation, planting and training, soil management, blossom bud formation, pollination, storage, and pruning. Fall, Winter, Spring. Lect. 2. Rec. and lab. 1, 3 hr. Credit 3.

\*The curriculum in Horticulture offers a considerable number of free electives in the junior and senior years. It is suggested that each student prepare a sequence of desirable electives leading to a definite objective, as for example a group of courses preparing him to teach agriculture in high school, or a group in History, Economics, English, Religious Education, Botany, Entomology, Chemistry, Poultry, Soils, or one of the other majors in Horticulture.

146. **Home Floriculture.** Principles and methods of growing house plants and garden flowers and arrangement of cut flowers in the home. Fall, Spring. Lect. and lab. 2, 2 hr. Credit 2.

154. **Greenhouse Management.** Principles and methods of plant growing under glass. Winter. Lect. 2. Rec. and lab. 1, 2 hr. Credit 3.

164A, 164B. **Vegetable Crops.** Areas of production and culture of the more important vegetable crops. Special emphasis is given to the potato. (A) Fall, Spring. Lect. 2. Credit 2. (B) Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

214. **Plant Propagation.** Fundamental principles underlying the sexual and asexual propagation of plants and practice in reproducing plants by the use of seeds, leaves, stems, or roots. Prerequisite: 114. Winter. Lect. 2. Rec. and lab. 1, 3 hr. Credit 3.

224. **Grapes and Small Fruits.** Principles and practices involved in handling home and commercial plantings of grapes, raspberries, blackberries, gooseberries, currants, and strawberries. Prerequisite: 114 or 214. Spring. Lect. 3. Rec. and lab. 1, 3 hr. Credit 4.

244. **Garden Flowers.** Description, nomenclature, classification, and culture of important garden flowers including annuals, perennials, bulbs, flowering vines, rock and water garden plants. Prerequisite: Botany 101 or equivalent. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

246. **Greenhouse Construction.** Various types of greenhouses; principles and methods of heating; preparation of plans and specifications for commercial and private ranges. Alternate years. Offered Fall, 1937. Lect. 1. Lect. and lab. 2, 2 hr. Credit 3.

301. **Inspection Tours.** Required of Horticultural students during Junior or Senior year. Depending on the major line of work, the student will visit fruit growing, vegetable crops, floriculture and nursery establishments under the personal direction of an instructor and make a formal written report of the trip. These trips will require from four to ten days depending on the places visited. Time to be arranged. Required, but requirement may be met by electing Hort. 501.

314. **General Horticulture.** Survey of the field of horticulture. Literature, materials, general practices. Summer. Lect. 6. Credit 3. May be substituted for Hort. 114.

315. **Garden Maintenance.** Care of lawns, shade trees, ornamental shrubs, fruit, vegetable and flower gardens, walks, drives, and garden accessories. Spring. Lect. 2. Demonstration and lab. 1, 3 hr. Credit 3.

316. **Nursery Methods.** Equipment, including land, packing sheds, storage sheds, frames, glass houses, irrigation devices; large scale propagation; transplanting and management of plants; relations to other fields of horticulture; protection of nursery plants from climatic, disease, and insect difficulties. Spring. Lect. 2. Rec. and lab. 1, 2 hr. Credit 3.

318. **Elements of Fruit Growing.** Production, storage and marketing of those horticultural crops which can be used profitably to supplement incomes on large farms or as principal sources of revenue on small farms. Prerequisite: 114. Fall. Lect. 2. Rec. 1. Credit 3.

324. **Fruit Judging.** Identification and judging of fruits with special emphasis on the apple. Prerequisite: 114 or equivalent. Fall. Lab. 1, 2 hr. Credit 1.

341, 342, 343. **Floriculture Practice.** Principles of and actual practice in greenhouse fumigation; light demands and light control for plants; humidity regulation; feeding plants; improved methods of plant and cut flower merchandising. Seasonable laboratory assignments supplementing other laboratory work in floriculture. Fall, Winter, Spring, respectively. Lab. 1, 3 hr. Credit 1 each course.

344. **Floral Arrangement and Judging.** Principles and methods of cut flower arrangement and design; interior decoration; exhibiting and judging flowers and plants. Prerequisite: 154 or 244. Enrollment limited to 10 students. Spring. Lect. 1. Lect. and lab. 2, 2 hr. Credit 3.

364, 365. **Vegetable Crops Practice.** Practical work in truck crops and market gardening. Prerequisite: 164. (364) Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3. (365) Fall. Lab. 1, 3 hr. Credit 1.

366. **Commercial Vegetable Crops.** Production of crops on a commercial scale in truck farming and market gardening. Lect. 2. Lab. 1, 3 hr. Credit 3. Prerequisite: 164. Winter.

401, 402, 403. **Seminar.** Fall, Winter, Spring, respectively. Credit 1 each course.

411, 412, 413. **Horticultural Problems.** Special investigation for undergraduate students. Special report required. Fall, Winter, Spring, respectively. Credit 2 each course.

**414. Marketing Horticultural Products.** Areas of production of horticultural crops, standardization, inspection, transportation, storage, price trends, agents of distribution, market news service, foreign markets, co-operative markets. Prerequisite: 114. Alternate years. Offered Winter, 1938. Lect. 2. Conf. 1. Credit 3.

**424. Exotic Fruits.** The propagation, growing, shipping, and selling of tropical and subtropical fruits are discussed. Alternate years. Offered Winter, 1939. Lect. 2. Credit 2.

**426. Fruit Farm Management.** The total, prorated and percentage costs of the various operations involved in growing a commercial apple orchard and producing a bushel of apples. Prerequisite: 521 or equivalent. Alternate years. Offered Fall, 1937. Lect. 2. Rec. and lab. 1, 3 hr. Credit 3.

**444. Conservatory Plants.** Identification, classification, propagation and culture of palms, ferns, orchids, begonias and other greenhouse exotics. Prerequisite: 154. Alternate years. Offered Winter, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3.

**464. Systematic Olericulture.** History and classification of vegetable groups, types, and varieties; vegetable exhibits and judging. Prerequisite: 164. Alternate years. Offered Fall, 1938. Lect. 2. Lect. and lab. 1, 2 hr. Credit 3.

**468, 469. Vegetable Forcing.** Management and culture of vegetables under glass. (468) Prerequisite: 164. Winter. Lect. 1. Lab. 1, 2 hr. Credit 2. (469) Prerequisite: 468. Spring. Lect. 1. Lect. and lab. 1, 2 hr. Credit 2.

**501. Travel Study.** Conducted in alternate years as follows: (1) through the principal horticultural regions of the eastern part of the United States and Canada and (2) through the principal horticultural regions of the western part of the United States. Outstanding examples of floriculture, fruit growing, truck farming, greenhouse management, nursery management, public parks and experimental stations will be visited. Reports in regular classroom and laboratory style will be required. First or second summer session as arranged. Credit 8. Mr. Pickett.

**514. History and Literature of Horticulture.** Origin of horticultural plants and practices. Prehistoric evidence of horticultural operations. Early historic references to the arts of gardening. Greek and Roman authors. Development of European and American literature of horticulture. Winter. Lect. 3. Credit 3. Mr. Pickett.

**516. Storage of Horticultural Products.** Control and measurement of temperature, humidity, and ventilation in fruit, vegetable, flower, and plant storages; principles and types of refrigeration; pre-cooling; changes in product in storage. Alternate years. Offered Winter, 1939. Lect. 1. Lab. 1, 3 hr. Credit 2. Mr. Plagge.

**518. Breeding of Horticultural Plants.** Status; progress; application of the principles of genetics to improvement of horticultural crops. Prerequisite: Gen. 300. Alternate years. Offered Fall, 1938. Rec. and lab. 2, 2 hr. Credit 2. Mr. Lantz.

**521, 522, 523. Orchardling.** Pomological regions, propagation, planting, varieties, culture, fertilization, pollination, pruning, winter injury, protection from insects and diseases, thinning, harvesting, grading, packing, storage and by-products. Prerequisite: 114. Fall, Winter, Spring, respectively. Lect. 2. Rec. and lab. 1, 2 hr. Credit 3 each course. Mr. Richey.

**524. Systematic Pomology.** Description, nomenclature, and classification of native and sub-tropical fruits; critical descriptions and identifications with special reference to relationship and classification of varieties. Prerequisite: 114. Fall. Lect. 2. Lab. 2, 2 hr. Credit 3. Mr. Schilleter.

**525, 526, 527, 528. Advanced Systematic Horticulture.** Identification, description, and classification of horticultural plants. Prerequisite: Bot. 594. Alternate years. (525) Fruits. Fall, 1937. Lect. 2. Lect. and lab. 1, 2 hr. Credit 3. Mr. Maney. (526) Greenhouse ornamentals. Winter, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Volz. (527) Outdoor ornamentals. Spring, 1938. Lect. 2. Rec. and lab. 1, 2 hr. Credit 3. Mr. Rothacker. (528) Vegetable crops. Summer, second term, 1938. Lect. 4. Lect. and lab. 2, 2 hr. Credit 3. Mr. Erwin.

**546, 547. Commercial Floriculture.** (546) Culture and propagation of florist bench crops and potted plants. Prerequisite: 154, 244. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3. (547) Culture of tender bedding plants; marketing cut flowers; organization and management of greenhouses and the retail store. Prerequisite: 546. Winter. Lect. 2. Lect. and lab. 1, 2 hr. Credit 3. Mr. Volz.

**564. Canning Crops.** Production of canning crops, study of seed strains, seed production, acreage contracts, grading. Prerequisite: 164. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Haber.

**600. Research.** Messrs. Pickett, Erwin, Maney, Richey, Schilleter, Volz, Haber.

601, 602, 603. **Experimental Horticulture.** (601) Principles of research as applied to horticulture. Fall. Rec. 3. Credit 3. Mr. Richey. (602) Methods, equipment and technique in horticultural research. Winter. Rec. and lab. 3, 2 hr. Credit 3. Mr. Richey. (603) Organization, support, training, publication and relationships in horticultural research. Spring. Lect. 3. Credit 3. Mr. Pickett.

604. **Graduate Conference.** Fall, Winter, Spring. Credit 1 each time elected. Mr. Pickett.

## HYGIENE

J. G. GRANT, Head of Department

Professor Edwards; Assistant Professors Goulding, Kalar, Schanche

*For information concerning the Division of Industrial Science, see page 131.*

For the Student Health Service of the department, see page 92.

The purpose of this department is to conserve and improve the health of students while in college and to give them such training and instruction as will enable them to maintain high health standards for themselves and for the community, after leaving college.

Hygiene instruction is given all first year women in industrial science and home economics.

### Description of Courses

104. **Health Education.** Required of all women students. The principles of healthful living both individually and as applied to the home group. Fall, Winter, Spring. Lect. and rec. 3. Lab. 1, 2 hr. Credit 2 or 3. (Administered by the Department of Hygiene with the Division of Home Economics co-operating.)

404. **Applied Hygiene.** Emphasis upon hygiene of the school, health of teacher and students; co-operating health agencies and sources of teaching material. Spring. Lect. 3. Credit 3.

## INDUSTRIAL ARTS

WILLIAM L. HUNTER, Head of Department

Assistant Professors Livingston, Schmidt

The purpose of the curriculum in Industrial Arts is to offer an adequate education for teachers of manual training in Iowa. Its aim is to prepare teachers for junior and senior high schools, and for the schools in the smaller communities; and to train for high grade related subjects, teachers and administrators in vocational and industrial schools, especially those established under the Smith-Hughes Act.

An examination of the outline of the Industrial Arts curriculum will show a well balanced program of courses in laboratory work, drawing, mathematics, English, sciences, and education. The special courses connected with the problems of Industrial Arts teaching are deferred to the latter part of the curriculum. Not infrequently requests come from schools for men who are prepared to teach two kinds of subjects—such as Industrial Arts and Coaching, Industrial Arts and Agri-



culture, Industrial Arts and Mathematics, Industrial Arts and Sciences, etc.

The technical part of the course is given in classes of the Engineering Division. The basic courses in education are given by the Department of Vocational Education. Graduation from this curriculum will entitle the student to a standard secondary certificate in Iowa, without examination. This will also secure a teacher's certificate in most of the other states.

### Curriculum In Industrial Arts

Leading to the degree of Bachelor of Science.

For graduate work, see page 157.

For entrance requirements, see page 99.

#### FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		General Chemistry	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		Elementary Woodwork	
Math. 101	5	Math. 102C	4	I.A. 106	3
Drawing and Projection		Theory of Proj. Draw.		Ornamental Concrete	
Engr.Dr. 131	2	Engr.Dr. 132	3	I.A. 107	2
Engineering Problems		Engineering Problems		Freehand Drawing	
Gen.E. 104	1	Gen.E. 105	1	Arch.E. 114	1
				House Design	
				Arch.E. 234	2
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	<u>16</u>		<u>16</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106C (Winter); Engr. 114, 115.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

#### SOPHOMORE YEAR

Woodfinishing		Advanced Woodwork		Ornamental Metalwork	
I.A. 105	2	I.A. 205	3	I.A. 104	3
Metal Shop		Elem. Teaching Problems		Carpentry	
M.E. 233	3	I.A. 110	3	I.A. 155	2
Mechanics and Heat		Elect. and Magnetism		Sound and Light	
Phys. 211	4	Phys. 212	4	Phys. 213	4
Expository Writing		Metal Casting		Freehand Drawing	
Engl. 204	2	M.E. 237	4	Arch.E. 115	1
General Psychology		Beginning Tech. Journalism		Heat Treat. of Metals	
Psych. 204	3	T.Jl. 225A	2	M.E. 238	4
Engineering Economics				Industria' History of U. S.	
Ec. 261	3			Hist. 235	3
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	<u>18</u>		<u>17</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Principles of Sociology		Methods of Teaching		Industrial Sociology	
Ec. 384	3	Voc.Ed. 305	4	Ec. 480	3
Industrial Arts Design		Care of Equipment		Electrical Construction	
I.A. 305	2	I.A. 306	2	I.A. 804	2
Principles of Education		Trade Analysis		General Shop	
Voc.Ed. 304	3	I.A. 318	3	I.A. 406	2
Hand Made Pottery		American Government		Psych. of Employment	
Cer.E. 324	2	Govt. 315	3	Psych. 538	2
Soc. Signif. Industrial Ed.		Psych. of Motivation		Shop Planning	
I.A. 317	3	Psych. 335	3	I.A. 309	3
Extempore Speaking				Tech. of Teaching Trades	
P.S. 311	2			I.A. 510	3
*Electives	3	*Electives	3	*Electives	3
	<hr/> 18		<hr/> 18		<hr/> 18

## SENIOR YEAR

Industrial Occupations		Organ. Adm. Ind. Arts		Found. of Indus. Educa.	
I.A. 504	3	I.A. 405	3	I.A. 408	3
History of Industrial Arts		Commercial Woods		Industrial Relations	
I.A. 404	3	For. 488	3	Ec. 406	3
Teaching Industrial Arts		Teaching Industrial Arts		Photography	
I.A. 515	3	I.A. 516	3	Phys. 316	3
Principles of Sec. Educa.		Mental Tests		Psychology of Learning	
Voc.Ed. 306	3	Psych. 434	3	Psych. 334	3
*Electives	6	Business Law		Applied Hygiene	
		Ec. 365	3	Hyg. 404	3
		*Electives	3	*Electives	3
	<hr/> 18		<hr/> 18		<hr/> 18

\*Electives are chosen in consultation with the head of the department. Opportunity is given to elect courses in agriculture, physical education, mathematics, etc. Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

## Description of Courses

104. **Ornamental Metalwork.** The use of metal in the construction of useful household articles; peening, twisting, forming, bending, and riveting. Spring. Rec. 1. Lab. 3, 2 hr. Credit 3.

105. **Woodfinishing.** Filling, staining, waxing, varnishing, and enameling; re-finishing of furniture. Fall. Lab. 2, 3 hr. Credit 2.

106. **Elementary Woodwork.** Care and adjustment of tools, elementary tool operations, construction of simple projects. Spring. Rec. 1. Lab. 3, 2 hr.. Credit 3.

107. **Ornamental Concrete.** Mixing, pouring, and curing of concrete; Keene's cement; the construction of useful articles of garden furniture. Spring. Lab. 2, 3 hr. Credit 2.

110. **Elementary Teaching Problems in Industrial Arts.** Objectives, organization, methods, projects and equipment. The object of this course is to furnish a foundation for teaching the industrial arts. Winter. Rec. 3. Credit 3.

155. **Carpentry.** (A.E. 155) Elements of building construction; care and use of carpenters' tools. Spring. Lab. 2, 3 hr. Credit 2.

204. **Woodturning.** The use of the woodturning lathe in the making of useful furniture. Winter. Lab. 2, 3 hr. Credit 2.

205. **Advanced Woodwork.** Cabinet making and joinery; use of power tools and machinery. Prerequisite: 106. Winter. Rec. 1. Lab. 3, 2 hr. Credit 3.

304. **Electrical Construction.** Winding of motors, making of battery chargers, wiring bell circuits, construction of transformers and other useful electrical apparatus. Spring. Lab. 2, 3 hr. Credit 2.

305. **Industrial Arts Design.** Proportion, balance, harmony, and gracefulness in the design of shop projects; period furniture. Prerequisite: senior college classification. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

306. **Care of Equipment.** Saw filing, band saw brazing, setting jointer knives, splicing of belts, etc. Winter. Lab. 2, 3 hr. Credit 2.

309. **Shop Planning.** Planning of school shops; selection and location of equipment; estimate of cost. Prerequisite: Senior college classification. Spring. Rec. 3. Credit 3.

317. **Social Significance of Industrial Education.** (Voc. Ed. 317.) The social influences bearing on industrial education and the reaction of this form of education on society itself. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

318. **Trade Analysis.** (Voc. Ed. 318.) Basic types of analyses. Preparation of instruction sheets for teaching trade subjects. Prerequisite: Senior college classification. Winter. Rec. 3. Credit 3.

404. **History of Industrial Arts.** An historical background of the present development of the industrial arts, essential to an understanding and appreciation of present problems. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

405. **Organization and Administration of Industrial Arts.** Supervision, organization, purchase of supplies, development of subject matter. Prerequisite: 110. Winter. Rec. 3. Credit 3.

406. **General Shop.** Construction of general shop projects; organization and methods of presentation suitable for the junior high school. Spring. Lab. 2, 3 hr. Credit 2.

408. **Foundations of Industrial Education.** (Voc. Ed. 408.) Development of the movement; the Smith-Hughes Act, state plans, and laws relating to industrial education. Spring. Rec. 3. Credit 3.

504. **Industrial Occupations.** Growth and development of important industries; statistics and trends in industry. For the teacher, counselor, and guide of adolescent pupils. Prerequisite: Psych. 538. Fall. Rec. 3. Credit 3. Mr. Hunter, Mr. Livingston.

510. **Technique of Teaching Trades.** (Voc. Ed. 510.) The teaching processes, methods of presentation and testing, lesson planning, organization for instruction. Spring. Rec. 3. Credit 3. Mr. Baird.

515, 516. **Teaching Industrial Arts.** (Voc. Ed. 515, 516.) Curricula, observation, supervised teaching, demonstrations, organization, and administration. Prerequisite: Voc. Ed. 305 or equivalent. Fall, Winter, respectively. Rec. and lab. 3. Credit 3 each course. Mr. Sharp, Mr. Hunter.

518. **Problems in Industrial Education.** (Voc. Ed. 518.) Administration and supervision of industrial education programs in public schools. Spring. Rec. 3. Credit 3. Mr. Baird.

524. **Industrial Conference Methods.** (Voc. Ed. 524.) Use of the conference method in instruction. Study and practice of conference procedure, devices, and technique. Prerequisite: industrial or industrial teaching experience. Summer. Rec. 6. Credit 3. Mr. Baird.

525. **Problems in Part-Time Education.** (Voc. Ed. 525) Demands upon supervisors, principals, teachers, and co-ordinators working in the field of part-time schools for employed minors. Winter. Rec. 3. Credit 3. Mr. Baird.

600. **Problems in Industrial Arts Education.** (Voc. Ed. 600) Summary of recent findings of research; methods of attack on new problems. Fall. Rec. 3. Credit 3. Mr. Hunter.

605. **Tests and Measurements in Industrial Arts.** Special application of tests and measurement technique to the industrial arts. Prerequisite: Psych. 434, or equivalent. Winter. Rec. 3. Credit 3. Mr. Hunter.

607. **Problems in Organization.** Typical problems in shop layouts and curricula for industrial arts in representative communities. The general shop, its purpose and organization. Spring. Rec. 3. Credit 3. Mr. Hunter, Mr. Livingston.

608. **Advanced Teaching Problems in Industrial Arts.** (Voc. Ed. 608.) Supervision, teaching, and promotion of industrial arts, including a study of successful systems now in use. Prerequisite: Undergraduate major or minor in education or psychology. Summer. Rec. 6. Credit 3. Mr. Hunter.

609. **Historical Research in Industrial Education.** (Voc. Ed. 609.) Original sources for historical research, individual problems, appreciation of the historical foundation of industrial education, significant movements in Europe and America. Summer. Rec. 6. Credit 3. Mr. Livingston.

610. **Analysis and Organization of Written Instruction.** Construction and method of use of instruction sheets. Spring. Rec. 3. Credit 3. Mr. Livingston.

614. **Objectives of Industrial Arts Education.** The purpose of the several phases of industrial arts education; historical background and an analysis for the future. Alternate years. Offered Summer, 1938. Rec. 6. Credit 3. Mr. Hunter.

## JUNIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Principles of Sociology		Methods of Teaching		Industrial Sociology	
Ec. 384	3	Voc.Ed. 305	4	Ec. 480	3
Industrial Arts Design		Care of Equipment		Electrical Construction	
I.A. 805	2	I.A. 306	2	I.A. 304	2
Principles of Education		Trade Analysis		General Shop	
Voc.Ed. 304	3	I.A. 318	3	I.A. 406	2
Hand Made Pottery		American Government		Psych. of Employment	
Cer.E. 824	2	Govt. 315	3	Psych. 538	2
Soc. Signif. Industrial Ed.		Psych. of Motivation		Shop Planning	
I.A. 817	3	Psych. 385	3	I.A. 309	3
Extempore Speaking				Tech. of Teaching Trades	
P.S. 311	2			I.A. 510	3
*Electives	3	*Electives	3	*Electives	3
	18		18		18

## SENIOR YEAR

Industrial Occupations		Organ. Adm. Ind. Arts		Found. of Indus. Educa.	
I.A. 504	3	I.A. 405	3	I.A. 408	3
History of Industrial Arts		Commercial Woods		Industrial Relations	
I.A. 404	3	For. 488	3	Ec. 406	3
Teaching Industrial Arts		Teaching Industrial Arts		Photography	
I.A. 515	3	I.A. 516	3	Phys. 316	3
Principles of Sec. Educa.		Mental Tests		Psychology of Learning	
Voc.Ed. 806	3	Psych. 434	3	Psych. 334	3
*Electives	6	Business Law		Applied Hygiene	
		Ec. 365	3	Hyg. 404	3
		*Electives	3	*Electives	3
	18		18		18

\*Electives are chosen in consultation with the head of the department. Opportunity is given to elect courses in agriculture, physical education, mathematics, etc. Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

## Description of Courses

104. **Ornamental Metalwork.** The use of metal in the construction of useful household articles; peening, twisting, forming, bending, and riveting. Spring. Rec. 1. Lab. 3, 2 hr. Credit 3.

105. **Woodfinishing.** Filling, staining, waxing, varnishing, and enameling; re-finishing of furniture. Fall. Lab. 2, 3 hr. Credit 2.

106. **Elementary Woodwork.** Care and adjustment of tools, elementary tool operations, construction of simple projects. Spring. Rec. 1. Lab. 3, 2 hr.. Credit 3.

107. **Ornamental Concrete.** Mixing, pouring, and curing of concrete; Keene's cement; the construction of useful articles of garden furniture. Spring. Lab. 2, 3 hr. Credit 2.

110. **Elementary Teaching Problems in Industrial Arts.** Objectives, organization, methods, projects and equipment. The object of this course is to furnish a foundation for teaching the industrial arts. Winter. Rec. 3. Credit 3.

155. **Carpentry.** (A.E. 155) Elements of building construction; care and use of carpenters' tools. Spring. Lab. 2, 3 hr. Credit 2.

204. **Woodturning.** The use of the woodturning lathe in the making of useful furniture. Winter. Lab. 2, 3 hr. Credit 2.

205. **Advanced Woodwork.** Cabinet making and joinery; use of power tools and machinery. Prerequisite: 106. Winter. Rec. 1. Lab. 3, 2 hr. Credit 3.

304. **Electrical Construction.** Winding of motors, making of battery chargers, wiring bell circuits, construction of transformers and other useful electrical apparatus. Spring. Lab. 2, 3 hr. Credit 2.

305. **Industrial Arts Design.** Proportion, balance, harmony, and gracefulness in the design of shop projects; period furniture. Prerequisite: senior college classification. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

306. **Care of Equipment.** Saw filing, band saw brazing, setting jointer knives, splicing of belts, etc. Winter. Lab. 2, 3 hr. Credit 2.

309. **Shop Planning.** Planning of school shops; selection and location of equipment; estimate of cost. Prerequisite: Senior college classification. Spring. Rec. 3. Credit 3.

317. **Social Significance of Industrial Education.** (Voc. Ed. 317.) The social influences bearing on industrial education and the reaction of this form of education on society itself. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

318. **Trade Analysis.** (Voc. Ed. 318.) Basic types of analyses. Preparation of instruction sheets for teaching trade subjects. Prerequisite: Senior college classification. Winter. Rec. 3. Credit 3.

404. **History of Industrial Arts.** An historical background of the present development of the industrial arts, essential to an understanding and appreciation of present problems. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

405. **Organization and Administration of Industrial Arts.** Supervision, organization, purchase of supplies, development of subject matter. Prerequisite: 110. Winter. Rec. 3. Credit 3.

406. **General Shop.** Construction of general shop projects; organization and methods of presentation suitable for the junior high school. Spring. Lab. 2, 3 hr. Credit 2.

408. **Foundations of Industrial Education.** (Voc. Ed. 408.) Development of the movement; the Smith-Hughes Act, state plans, and laws relating to industrial education. Spring. Rec. 3. Credit 3.

504. **Industrial Occupations.** Growth and development of important industries; statistics and trends in industry. For the teacher, counselor, and guide of adolescent pupils. Prerequisite: Psych. 538. Fall. Rec. 3. Credit 3. Mr. Hunter, Mr. Livingston.

510. **Technique of Teaching Trades.** (Voc. Ed. 510.) The teaching processes, methods of presentation and testing, lesson planning, organization for instruction. Spring. Rec. 3. Credit 3. Mr. Baird.

515, 516. **Teaching Industrial Arts.** (Voc. Ed. 515, 516.) Curricula, observation, supervised teaching, demonstrations, organization, and administration. Prerequisite: Voc. Ed. 305 or equivalent. Fall, Winter, respectively. Rec. and lab. 3. Credit 3 each course. Mr. Sharp, Mr. Hunter.

518. **Problems in Industrial Education.** (Voc. Ed. 518.) Administration and supervision of industrial education programs in public schools. Spring. Rec. 3. Credit 3. Mr. Baird.

524. **Industrial Conference Methods.** (Voc. Ed. 524.) Use of the conference method in instruction. Study and practice of conference procedure, devices, and technique. Prerequisite: industrial or industrial teaching experience. Summer. Rec. 6. Credit 3. Mr. Baird.

525. **Problems in Part-Time Education.** (Voc. Ed. 525.) Demands upon supervisors, principals, teachers, and co-ordinators working in the field of part-time schools for employed minors. Winter. Rec. 3. Credit 3. Mr. Baird.

600. **Problems in Industrial Arts Education.** (Voc. Ed. 600.) Summary of recent findings of research; methods of attack on new problems. Fall. Rec. 3. Credit 3. Mr. Hunter.

605. **Tests and Measurements in Industrial Arts.** Special application of tests and measurement technique to the industrial arts. Prerequisite: Psych. 434, or equivalent. Winter. Rec. 3. Credit 3. Mr. Hunter.

607. **Problems in Organization.** Typical problems in shop layouts and curricula for industrial arts in representative communities. The general shop, its purpose and organization. Spring. Rec. 3. Credit 3. Mr. Hunter, Mr. Livingston.

608. **Advanced Teaching Problems in Industrial Arts.** (Voc. Ed. 608.) Supervision, teaching, and promotion of industrial arts, including a study of successful systems now in use. Prerequisite: Undergraduate major or minor in education or psychology. Summer. Rec. 6. Credit 3. Mr. Hunter.

609. **Historical Research in Industrial Education.** (Voc. Ed. 609.) Original sources for historical research, individual problems, appreciation of the historical foundation of industrial education, significant movements in Europe and America. Summer. Rec. 6. Credit 3. Mr. Livingston.

610. **Analysis and Organization of Written Instruction.** Construction and method of use of instruction sheets. Spring. Rec. 3. Credit 3. Mr. Livingston.

614. **Objectives of Industrial Arts Education.** The purpose of the several phases of industrial arts education; historical background and an analysis for the future. Alternate years. Offered Summer, 1938. Rec. 6. Credit 3. Mr. Hunter.

617. **Curriculum Building in Industrial Education.** (Voc. Ed. 617.) Organization of curricula for shop and related technical instruction in trade technical schools or classes. Prerequisite: 318 or equivalent. Winter. Rec. 3. Credit 3. Mr. Hunter.

620. **Advanced Industrial Arts Design.** Design principles and their application in the industrial arts laboratory with special reference to modern tendencies and new industrial materials. Alternate years. Offered Summer, 1938. Rec. 2. Lab. 2, 3 hr. Credit 2. Mr. Livingston.

630. **Visual Methods in Industrial Arts Education.** Sources, selection, preparation and use of visual instruction materials. Review of scientific studies. Summer. Rec. 2. Lab. 2, 3 hr. Credit 2. Mr. Hunter.

650. **Research in Industrial Arts Education.** (Voc. Ed. 650.) Messrs. Hunter, Livingston.

## INDUSTRIAL SCIENCE

CHARLES E. FRILEY, Acting Dean of Industrial Science

HAROLD V. GASKILL, Assistant to the Dean

The Division of Industrial Science offers the following curricula:

1. The Curriculum in Industrial Science is planned to meet the needs of the following classes of students:

- (a) Those who are interested in science as related to the practical aspects of industry, commerce, agriculture, engineering, home economics, and veterinary medicine.
- (b) Those who desire thorough, fundamental preparation for research in the sciences or for teaching the sciences at the secondary and collegiate levels.
- (c) Those who have not made a definite decision as to their vocation, and who desire an education that is strong and well-balanced in the sciences and general studies as a foundation for further scientific or professional study, or as a preparation for intelligent citizenship.

The student's major work may be taken in one of the following fields:

**BACTERIOLOGY:** General and systematic; dairy; soil; veterinary and pathogenic; food and sanitary; household; physiological and fermentation. (p. 192.)

**BOTANY:** Plant ecology; plant morphology; mycology; plant pathology; plant physiology; systematic botany. (p. 194.)

**CHEMISTRY:** Analytical; bio-physical; enzyme; food and sanitary; inorganic and qualitative analysis; organic; physical; plant; physiological and nutritional; soil; textile. (p. 205.)

**ECONOMICS AND SOCIOLOGY:** Agricultural economics; consumption economics; industrial economics; general economics; rural sociology. (p. 225.)

**GENETICS:** Heredity in relation to the improvement of animals and plants. (p. 248.)

**GEOLOGY:** Economic; agricultural; general. (p. 249.)

**ECONOMIC HISTORY:** Agriculture; industry; commerce. (p. 251.)

**MATHEMATICS:** Applied (mechanics and physics); biometrics; analysis and geometry. (p. 293.)

**PHYSICAL EDUCATION:** For men, in combination with a major in another science. (p. 305.)

**PHYSICS:** Applied; general; mathematical. (p. 308.)

**ZOOLOGY:** Economic zoology; entomology; cytology; embryology and histology; parasitology; physiology; protozoology; wildlife conservation; apiculture (p. 338.)

The Curriculum in Industrial Science is outlined below.

Preparation for Medicine and Veterinary Medicine—in the curriculum in Industrial Science, special programs are offered for Pre-Medical and Pre-Veterinary students. See page 287.

2. Curriculum in Chemical Technology. See page 205.

3. Curriculum in Agricultural Economics and Rural Sociology. See page 166.

4. Combined Curriculum in Science and Law. See page 287.

5. Combined Curriculum in Science and Medicine. See page 288.

### Curriculum In Industrial Science

(Biological, Physical, and Social Sciences)

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

During the first two years of his course, while in the Junior College, the student is expected to lay a broad foundation for later specialization or for an immediate career.

To secure an adequate background in the sciences and general studies in the Junior College, the curriculum in Industrial Science is designed to allow latitude for personal choice.

#### FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Composition		Composition		Composition	
Engl. 101 <sup>1</sup>	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		*Analytic Geometry	
Math. 101	5	Math. 102A	5	Math. 103	5
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101	4	Chem. 102	4	Chem. 103	4
Biology, Botany		Biology, Botany		Biology, Botany	
†Geology or Zoology	3	†Geology or Zoology	3	†Geology or Zoology	3
				Health Education	
				Hyg. 104 (women)	2
Military 121 (men)	1	Military 122 (men)	1	Military 123 (men)	1
	15 or 16		15 or 16		16 or 18

In addition to the courses listed above, each student will be required to include in his schedule: I.S. 104, 105, 120, Orientation; Physical Education each quarter (for women, 1 credit for the year; required of men—without credit).

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

\*Students planning to major in Economics may substitute Mathematics of Investment, Mathematics 206, for Mathematics 103.

†If Geology is chosen in the Freshman year, a Biological Science is to be selected as one of the electives in the Sophomore year.

## SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Early 19th Century		Mid-19th Century		†Reasoning and Writing	
Engl. 254	3	Engl. 255	3	Engl. 205	3
French or German		French or German		French or German	
M.L. 201 or 231	3	M.L. 202 or 232	3	M.L. 203 or 233	3
*Electives	10	*Electives	10	*Electives	10
Military 221 (men)	1	Military 222 (men)	1	Military 223 (men)	1
	<u>16 or 17</u>		<u>16 or 17</u>		<u>17</u>

In addition to the courses listed above, each student will be required to include in his schedule each quarter: Physical Education (for women, 1 credit for the year; required of men—without credit.)

†For sufficient reason another course in English, or a course in Technical Journalism or History, may be substituted for English 205.

## \*ELECTIVES

Electives to the extent of ten hours per quarter are to be chosen from the three groups below, provided that at least two of the groups are represented in the choice. It is expected that the major work of the Junior and Senior years will be taken in the field represented by one of the sequences so chosen. Students who do not choose a Biological Science in the Freshman year will do so in the Sophomore year.

## BIOLOGICAL SCIENCES

BACTERIOLOGY:	Chem. 255 3 cr.;	Chem. 256, 3 cr.;	Bact. 304, 5 cr.
BOTANY:	Bot. 102, 3 cr.;	Bot. 205, 4 cr.;	Bot. 103, 3 cr.
	or, Bot. 205, 4 cr.;	Bot. 207, 4 cr.;	Bot. 206, 4 cr.
GENETICS:	Phys. 211, 4 cr.;	Phys. 212, 4 cr.;	Phys. 213, 4 cr.
	and Bot. 205, 4 cr.;	Gen. 300, 3 cr.;	Zool. 203, 3 cr.
PHYSICAL			
EDUCATION:	Phys.Ed. 304, 2 cr.;	Phys.Ed. 305, 2 cr.;	Phys.Ed. 306, 2 cr.
~ (for men)	and Psych. 204, 3 cr.;	Psych. 334, 3 cr.;	Voc.Ed. 304, 3 cr.
ZOOLOGY:	Zool. 274, 4 cr.;	Zool. 234, 4 cr.;	Zool. 315, 3 cr.
	or, Zool. 255, 5 cr.;	Zool. 255, 5 cr.;	Zool. 224, 4 cr.
			Zool. 274, 4 cr.

## PHYSICAL SCIENCES AND MATHEMATICS

CHEMISTRY:	Chem. 211, 4 cr.;	Chem. 212, 4 cr.;	Chem. 213, 3 cr.
	or, Chem. 201, 2 cr.;	Chem. 202, 2 cr.;	Chem. 203, 3 cr.
GEOLOGY:	Geol. 201, 3 or 4 cr.;	Geol. 202, 3 or 4 cr.;	Geol. 203, 3 or 4 cr.;
	or, Geol. 354, 4 cr.;	Geol. 355, 4 cr.;	Geol. 356, 4 cr.
MATHEMATICS:	Math. 211, 4 cr.;	Math. 212, 4 cr.;	Math. 213, 4 cr.
PHYSICS:	Phys. 211, 4 cr.;	Phys. 212, 4 cr.;	Phys. 213, 4 cr.
	or, Phys. 221, 5 cr.;	Phys. 222, 5 cr.;	Phys. 223, 5 cr.

## SOCIAL SCIENCES

ECONOMICS			
AND SOCIOLOGY:	Ec. 201, 3 cr.;	Ec. 202, 3 cr.;	Ec. 203, 3 cr.
	or, Ec. 384, 3 cr.;	Ec. 385, 3 cr.;	Ec. 386, 3 cr.
HISTORY:	Hist. 211, 3 cr.;	Hist. 212, 3 cr.;	Hist. 213, 3 cr.
	or, Govt. 315, 3 cr.;	Hist. 234, 3 cr.;	Hist. 235, 3 cr.
PSYCHOLOGY:	Psych. 204, 3 cr.;	Psych. 334, 3 cr.;	Psych. 335, 3 cr.

## Junior and Senior Years

1. In the Spring quarter of the Sophomore year the student will select a major and two minor fields of study, which will form the basis for the program of the Junior and Senior years. This program will cover a minimum of ninety-six credits, sixteen each quarter. The complete program will be worked out by the student in conference with the Head of



the Major Department, subject to the approval of the Dean of Industrial Science. Duplicate copies are to be filed in the Dean's office.

2. The subjects making up the program of the Junior and Senior years must ordinarily be of Senior College rank.

3. The following subjects must be included as indicated, unless completed previously:

(a) French or German, M. L. 301, 302, 303; or 331, 332, 333. Junior year.

(b) Principles of Economics, Ec. 201, 202. Junior year.

(c) American Government, Govt. 315, Junior year.

(d) Extempore Speaking, P.S. 311, 3 credits, Senior year.

4. A minimum of thirty credits shall be chosen from the field in which the major work is taken. In addition, such supporting subjects from allied departments shall be included as are necessary for the proper development of the major field. The minor fields, each covering a minimum of 15 credits, may be taken in any other department of the Division of Industrial Science, or, for sufficient reason, from departments in other Divisions. If the major field is Physical Education, one of the minor fields must be in another science and must include at least 27 credits. Students preparing to teach may count the required work in Vocational Education as a minor.

5. The remaining credits may be selected from other departments in the Division of Industrial Science, or from other Divisions of the College. It is strongly urged that the student include additional work in English, Government, History, Music, Physical Education, Psychology, Public Speaking, or Religious Education.

### **Combined Curriculum In Science and Law**

Leading to the degree of Bachelor of Science.

Students planning for the study of law may receive the degree of Bachelor of Science from Iowa State College upon satisfying the following requirements:

1. Completion of the first three years in the curriculum in Industrial Science with major in economics;

2. Completion of the first year of the law curriculum in a recognized law school;

3. Transfer back to this College of credits earned in the law school;

4. Fulfilling the quality point requirement;

5. Formal application for the degree at least three months in advance of its award.

## **PREPARATION FOR THE STUDY OF MEDICINE**

### **Curriculum for Pre-Medical and Pre-Veterinary Students**

For entrance requirements, see page 99.

Notes: 1. Students preparing for the regular Curriculum in Veterinary Medicine, page 320, for admission to which one year of college work is required, will take the Freshman year as indicated below, with the modifications suggested in the footnote. See also Restricted Enrollment, page 319.

2. Pre-Medical students will take at least the work of the Freshman and Sophomore years, as outlined below. This program covers the minimum requirements for admission to medical school. In this connection attention is called to the Combined Curriculum in Science and Medicine outlined below.

## FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
Animal Biology		Animal Biology		†Animal Biology	
Zool. 111	4	Zool. 112	4	Zool. 113	4
*College Algebra		*Plane Trigonometry		*Ind. History of U. S.	
Math. 101	5	Math. 102A	5	Hist. 235	3
Military 121	1	Military 122	1	Military 123	1
	<hr/> 17		<hr/> 17		<hr/> 15

†Pre-Veterinary students will substitute Bot. 101, General Botany.

\*Pre-Veterinary students may substitute one of the following: M.L. 201, 202, 203, French; M.L. 231, 232, 233, German; Hist. 211, 212, 213, Introduction to the Social Sciences.

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Orientation, I.S. 104, 105, 120.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

Organic Chemistry		Organic Chemistry		Organic Chemistry	
Chem. 331	4	Chem. 332	4	Chem. 333	4
French or German		French or German		French or German	
M.L. 201 or 231	3	M.L. 202 or 232	3	M.L. 203 or 233	3
General Physics		General Physics		General Physics	
Phys. 211	4	Phys. 212	4	Phys. 213	4
*Electives	4	*Electives	4	Vertebrate Zoology	
				Zool. 224	4
Military 221	1	Military 222	1	Military 223	1
	<hr/> 16		<hr/> 16		<hr/> 16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

\*The elective subjects are to be chosen with a view to satisfying special requirements of the Medical school which the student expects to enter.

## Combined Curriculum in Science and Medicine

Leading to the degree of Bachelor of Science.

Students planning for the study of medicine may receive the degree of Bachelor of Science from Iowa State College upon satisfying the following requirements:

1. Completion of the two years of the Pre-Medical curriculum, outlined above;

2. Completion of a third or Junior year at Iowa State College, with the principal studies in Biological Sciences and Chemistry; (Ec. 201, 202; Govt. 315; P. S. 311; Mod. Lang. 301, 302, 303, or M. L. 331, 332, 333 must be included unless previously completed.)

3. Completion of the first year of the medical curriculum in a Class A medical college;

4. Transfer back to this College of credits earned in the medical school;

5. Fulfilling the quality point requirement;
6. Formal application for the degree at least three months in advance of its award.

### Description of Courses

104, 105. **Orientation.** Lectures and class work designed to aid the first year student in adjusting himself to his environment both in college and afterwards. (104) College Problems. Fall. All freshmen. Lectures 2. Women, additional lectures in Social Ethics. (105) Survey of the Sciences. Winter. Lectures 1. Required each course.

120. **Personal Development.** The personal, social, and occupational relationships that are of importance in the development of personality. Fall, Winter, Spring. Lect. 1. Required.

417. **Directed Observation and Practice Teaching in the Sciences.** (Voc Ed. 417.) Observation, evaluation of instruction, lesson planning, and classroom teaching in the sciences. Prerequisite: Voc. Ed. 305, or equivalent, special methods, and 20 credits in subject matter field. To be arranged in advance. Fall, Winter, Spring. Credit 5.

420. **Leadership and Leaders.** An analysis of the qualities of leadership and the characteristics of leaders. Fall, Spring. Rec. 2. Credit 2.

424. **Leadership and Leaders.** Continuation of 420. Prerequisite: 420. Spring. Rec. 1. Credit 1.

425. **Organization Management and Administration.** For officers and stewards of organizations. Spring. Rec. 1. Credit 1.

## LANDSCAPE ARCHITECTURE

P. H. ELWOOD, JR., Head of Department

Assistant Professors Hanson, Rothacker  
Extension Workers Fitzimmons, Johnson, Morris

*For information concerning the Division of Agriculture, see page 120.*

The most important function of Landscape Architecture is the adaptation of land areas to human service whether in urban regions or in the broad rural countryside. Its relation to the location of buildings and the treatment of their surroundings requires a consideration of architectural and engineering features. The materials used are mainly included within the fields of horticulture, forestry, geology, and civil engineering, to which it bears much the same relation that architecture does to structural engineering and similar technical subjects.

Landscape Architecture includes the design, construction, planting, and maintenance of home grounds, estates, parks, cemeteries, school grounds, public and private institutions and sub-divisions, towns and regional planning, including recreational landscape design, and other planning problems.

There are opportunities for competent professional men, both in private practice and in public employ as landscape architects, city planners, park superintendents, landscape recreational engineers for large state and national holdings and public reservations as well as in various phases of government service.

This department is accredited by the American Society of Landscape Architects and graduates are eligible for competition for the two-year traveling Fellowship at the American Academy in Rome. Each year

two graduates are selected for competition for the Ryerson European traveling Fellowship of the Lake Forest Foundation valued at approximately \$1,200.

The Fleming Atelier in Landscape Architecture at Wyoming, New York, has been opened for advanced professional study and practice under the personal direction of Mr. Bryant Fleming, distinguished Landscape Architect, and Architect. Credit for the work at the atelier is granted toward the practical experience and travel necessary for graduation in Landscape Architecture or toward the non-resident requirement for the degree of Master of Landscape Architecture.

Students in Landscape Architecture who wish to take a five-year curriculum are advised to inform the head of the department as early as possible so that their classification may be somewhat broadened and liberalized.

### Curriculum In Landscape Architecture

Leading to the degree of Bachelor of Science.

Six months of practical landscape work is required before graduation. This may include either three months at the Fleming Atelier and three months of other approved professional experience, or six months spent in approved travel study in Europe or the U. S. A.

For entrance requirements, see page 99.

For graduate work, see page 158.

#### FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Architectural Design		Architectural Design		Architectural Design	
Arch.E. 271B <sup>1</sup>	3	Arch.E. 272B	3	Arch.E. 273B	3
Freehand Drawing		Freehand Drawing		Freehand Drawing	
Arch.E. 114	1	Arch.E. 115	1	Arch.E. 325	2
General Botany		General Botany		Surveying	
Bot. 101	3	Bot. 102	3	C.E. 116	3
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		Princ. Landscape Design	
Math. 101	5	Math. 102A	5	L.A. 106	1
Military 121	1	Military 122	1	General Horticulture	3
				Hort. 114 or	
				General Botany	
				Bot. 103	
				Military 123	1
	<hr/> 16		<hr/> 16		<hr/> 16

In addition to the courses listed above, each student will be required to include in his schedule: Phys. Ed. 101, 102, 103; Library 106A (Fall); L.A. 105 (Winter); Orientation, Ag. 101, 102; Ag. 104, see page 177.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Hist. Landscape Design		Hist. Landscape Design		Hist. Landscape Design	
L.A. 201	2	L.A. 202	3	L.A. 203	3
El. of Landscape Design		El. of Landscape Design		El. of Landscape Design	
L.A. 211	2	L.A. 212	2	L.A. 213	2
Princ. Landscape Design		Plant Materials		Plant Materials	
L.A. 107	3	L.A. 231	2	L.A. 232	3
Freehand Drawing		Architectural Design		Freehand Drawing	
Arch.E. 221	1	Arch.E. 381B	2	Arch.E. 231	2
Freehand Drawing		General Chemistry		Garden Flowers	
Arch.E. 222	1	Chem. 102	4	Hort. 244	3
General Chemistry		Surveying		Business Law	
Chem. 101	4	C.E. 218	3	Ec. 365	3
Surveying		Military 222	1	Military 223	1
C.E. 217	4				
Military 221	1				
	<hr/> 18		<hr/> 17		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

Landscape Design		Landscape Design		Landscape Design	
L.A. 311	3	L.A. 312	3	L.A. 313	3
Plant Materials		Planting Design		Planting Design	
L.A. 333	3	L.A. 334	3	L.A. 335	3
Details of Construction		Details of Construction		Adv. Landscape Constr.	
L.A. 301	3	L.A. 302	3	L.A. 303	2
Technical Journalism		American Government		Landscape Practice	
T.Jl. 225	3	Govt. 315	3	L.A. 341	R
Extempore Speaking		Feature Writing		General Physics	
P.S. 311	2	T.Jl. 335	3	Phys. 204	3
Soils		General Psychology		Physiography	
Soils 264	3	Psych. 204	3	Geol. 324	4
	<hr/> 17		<hr/> 18	Farm Forestry	
				For. 100	3
					<hr/> 18

## SENIOR YEAR

Adv. Landscape Design		Adv. Landscape Design		Adv. Landscape Design	
L.A. 411	4	L.A. 412	4	L.A. 413	4
City or Town Planning		Institutional Planning		Rec. and Reg. Planning	
L.A. 401	3	L.A. 402	2	L.A. 403	3
Public Rec. Facilities		Regional Planning		Professional Procedure	
L.A. 404	3	C.C. 414	2	L.A. 441	3
Planting Composition		World Literature		Landscape Practice	
L.A. 436	3	Engl. 355	3	L.A. 342	R
History of Architecture		History of Architecture		History of Architecture	
Arch.E. 351	3	Arch.E. 352	3	Arch.E. 353	3
Roads and Pavements		Engr. City Planning		El. Entomology	
C.E. 354	3	C.E. 404	3	Zool. 274	4
	<hr/> 19	Freehand Drawing			
		Arch.E. 324	2		
			<hr/> 19		<hr/> 17

Some courses may be omitted by students appointed to the Reserve Officers' Training Corps, after consultation with the head of the department. See page 301.

## Description of Courses

105. Introduction to Landscape Architecture. The field of landscape architecture, its scope and methods. Winter. Lect. 1. Required.

106, 107. Theory and Principles of Landscape Design. Lectures, recitations, assigned readings and reports. (106) Spring. Lect. 1. Credit 1. (107) Fall. Lect. 1. Rec. 2. Credit 3.

**201. History of Landscape Architecture.** Introduction to the study of the great examples of landscape architecture throughout the world. Special emphasis on the relations of the arts to each other and to landscape architecture. Readings, reports. No prerequisite. Fall. Lectures 2. Credit 2.

**202, 203. History of Landscape Design.** Development of landscape architecture from antiquity to modern times, with its relation to and the influences of allied arts. Lectures, readings, abstracts, and reports. Winter, Spring, respectively. Lect. 3. Credit 3 each course.

**206. Planning Home Landscapes.** Appreciation of our native and humanized landscapes, with special attention to the improvement of the home grounds. Open to all students. Fall, Winter, Spring. Lect. 2. Credit 2.

**208. Rural Landscape Design.** Preparation of plans for farmsteads, small house lots, home and school grounds, as well as other public areas. Especially designed to meet the needs of Agricultural Engineering and Horticulture students, and those interested in County Agent work. Winter. Lect. 2. Lab. 1, 3 hr. Credit 3.

**211, 212, 213. Elements of Landscape Design.** Simple problems in design and presentation. (211) Fall. Prerequisite: 106, C.E. 116. (212) Winter. Prerequisite: 211. (213) Spring. Prerequisite: 212. Lab. 2, 3 hr. Credit 2 each course.

**231, 232. Plant Materials.** (231) An introduction to the study of plant materials as used in landscape architecture. Classification, nomenclature, requirements, sources, with winter twig identification. Winter. Lect. 1. Lab. 1, 3 hr. Credit 2. (232) Continuation of 231. Applied to deciduous trees and shrubs with special emphasis on their seasonal landscape character and usage. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

**301, 302, 303. Details of Construction and Office Administration.** Lectures, readings, drawings, and problems. (301) Fall. Prerequisite: C.E. 116. (302) Winter. Prerequisite: 301. Lect. 3. Credit 3 each course. (303) Prerequisite: 302. Theory and drafting room problems in landscape construction including grading, drainage, and utility plans, estimate of cuts, fills, and cost data. Spring. Lab. 2, 3 hr. Credit 2.

**311, 312, 313. Landscape Design.** Design of private and public properties based on actual topographies. Drafting, field work, reports, criticisms. Prerequisite: 213. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

**333. Plant Materials.** Continuation of 232. Trees and shrubs, vines, evergreens, and herbaceous material. Field trips and reports. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3.

**334, 335. Planting Design.** Arrangement and use of plants in landscape and architectural design with drafting and field practice. Prerequisite: 311, 333. Winter, Spring. Lect. 1. Lab. 2, 3 hr. Credit 3 each course.

**341, 342, 343. Travel and Practice.** Study of notable works in landscape design and observation of actual construction and operation in the field. (341) Inspection tour. Spring. Junior year. Required. (342) Inspection tour. Spring. Senior year. Required. (343) Foreign or domestic travel course. First hand study, under direction of Mr. Elwood, of the masterpieces of landscape architecture and allied arts in Europe and Asia, as well as America. Not required but recommended for all advanced students and graduates. (341) (342) No credit. (343) Summer. Credit 3 to 10.

**366. Special Problems.** Selected problems for balancing or completing individual student requirements. Fall, Winter, Spring.

**401. City or Town Planning.** Lectures and text on functional planning of the city including the fundamentals and historical development of civic design, with particular attention to the broader phases of city planning. Fall. Lect. 1. Rec. 2. Credit 3.

**402. Institutional Planning.** Design of school, airport, and other public and semi-public institutional properties. Prerequisite: 401. Winter. Lect. 1. Rec. 1. Credit 2.

**403. Recreational and Regional Planning.** Recreational aspects of landscape architecture including parks, playgrounds, waterfronts, and public reservations. Prerequisite: 402, except for Forestry students, or by special permission from head of department. Spring. Lect. 1. Rec. 2. Credit 3.

**404. Public Recreational Facilities.** A consideration of the principles of their design, construction, and operation with special emphasis on national and state parks and forests. Fall. Lect. 2. Rec. 1. Credit 3.

**411, 412, 413. Advanced Landscape Design.** Design of public, semi-public, and private properties. Prerequisite: 313. Lab. 4, 3 hr. Credit 4.

436. **Advanced Planting Composition and Design.** The principles of design applied to the use of plants in various types of landscape problems. Prerequisite: 335. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3.

441. **Professional Procedure.** Office organization, forms, field operations, professional ethics, and public relations. Prerequisite: 311. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

• 600. **Research.** Mr. Elwood.

## LIBRARY

CHARLES H. BROWN, Head of Department

Associate Professor Dunbar; Assistant Professor Warner; Instructors Crawford, Ford, Orr

*For information concerning the Division of Industrial Science, see page 131.*

## INSTRUCTION IN LIBRARY USAGE AND METHODS

Courses required of all Freshmen are designed to give facility in the use of books and the use of libraries.

In addition, the library affords facilities for bibliographic research in the scientific and technical literature of the departments giving graduate instruction. "Bibliographic Research" (Lib. 614), may be allowed as either major or minor credit in any department.

### Description of Courses

106. **Library Instruction.** Use of books, use of library, and a survey of literature of major curricula.

A. For students in agriculture. Six weeks. Fall.

B. For students in home economics. One half of the course on Orientation, (H.Ec. 101). Fall.

C. For students in engineering. Six weeks. Winter.

D. For students in industrial science. Three weeks of the course on Orientation, (I.S. 104). Fall.

614. **Bibliographic Research.** Lectures and practice on the location of printed material and on the preparation of bibliographies on technical and scientific subjects. Fall, Winter. Credit 1. Mr. Brown, Mr. Dunbar.

## MATHEMATICS

E. R. SMITH, Head of Department

Professors Holl, McKelvey, Snedecor; Associate Professors Allen, Atanasoff, Gouwens, Herr, Robinson; Assistant Professors Anderson, Brandt, Daniells, Fleming, Hinrichsen; Instructors Brandner, Robertson, Sagen, H. Smith; Graduate Assistants Davis, Gross; Fellows Anderson, Bates, Norton, Rock, Thorne

*For information concerning the Division of Industrial Science, see page 131.*

The work of the Department of Mathematics is directed to the following ends:

1. The development of intellectual strength.
2. Accuracy in presentation of mathematical truths.
3. The acquiring of such command of the subject matter of mathematics as will make it a valuable instrument in higher scientific and technical study and research.
4. The specialized application of mathematics to industry and industrial education.

### Curriculum in Industrial Science—Major Mathematics

For Freshman and Sophomore years, see page 285.

For Junior and Senior years, see page 286.

### Description of Courses

For description of non-collegiate courses, see page 347.

101. **College Algebra.**\*\* Prerequisite: three semesters secondary-school algebra. Fall, Winter, Spring. Rec. 5. Credit 5.

102. **Plane Trigonometry.** Prerequisite: 101.

A. For students in forestry, industrial science, and landscape architecture. Fall, Winter, Spring. Rec. 5. Credit 5.

C. For students in engineering. Must be preceded or accompanied by Gen. Engr. 105. Fall, Winter, Spring. Rec. 4. Credit 4.

103. **Plane Analytic Geometry.** Prerequisite: 102. Fall, Winter, Spring. Rec. 5. Credit 5.

136. **Solid Geometry.** Prerequisite: plane geometry. Fall. Rec. 3. Credit 3.

205. **Mathematics for Students of Agriculture.** Prerequisite: entrance algebra. Fall, Winter, Spring. Rec. 4. Credit 4.

206, 207. **Mathematical Theory of Investments.** Prerequisite: 102. (206) Rec. 5. Credit 5. (207) A second quarter in life insurance will be given occasionally. Rec. 3. Credit 3.

211, 212, 213. **Calculus.** Prerequisite: 103. (211) Differential calculus. (212) Integral calculus with applications. (213) Applied calculus. Fall, Winter, Spring. Rec. 4. Credit 4 each course.

241, 242, 243. **General Mathematics and Statistics.** Linear, quadratic, exponential and logarithmic functions; graphing, interpolation, use of tables; elements of calculus and application to simple functions; progressions; interest and annuities; permutations and combinations; probability; curve fitting; averages, dispersion, correlation, periodicity, index numbers. Prerequisite: entrance algebra. Fall, Winter, Spring, respectively. Rec. 4. Credit 4 each course.

300. **Theory of Equations.** Complex numbers, general solutions of the cubic and biquadratic. Horner's and Newton's methods of approximating roots, systems of equations, and elements of determinants. Prerequisite: 213. Spring. Rec. 3. Credit 3.

314, 315. **Differential Equations.** (314) The formulation of practical problems as solutions of differential equations, methods of solving type forms. Fall, Spring. (315) Systems of equations, singular solutions, theoretical considerations and an introduction to partial differential equations. Prerequisite: 213. Winter. Rec. 3. Credit 3 each course.

316. **Differential Equations for Electrical Engineering Students.** Prerequisite: 213. Fall. Rec. 4. Credit 4.

330. **College Geometry.** Geometrical constructions, properties of triangles, transversals, harmonic sections, and systems of circles. Designed for students who expect to teach secondary-school geometry. Prerequisite: 213. Rec. 3. Credit 3.

400. **Numerical Computation.** Interpolation, numerical solution of equations, approximations, numerical integration, and construction of tables. Prerequisite: 314. Rec. 3. Credit 3.

\*\*Freshman students who show deficient preparation in mathematics may be assigned by the Dean of the Junior College and the Dean of the Division to special classes in non-collegiate mathematics until they are prepared to take up college mathematics.



405, 406. **Biostatistics.** A general course including applications of calculus to biology. Prerequisite: 205. Fall, Winter, respectively. Rec. 3. Credit 3 each course.

441, 442, 443. **Statistical Methods. Biometrics.** Primarily for students doing major work in the biological sciences. Prerequisite: senior college classification. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

444, 445. **Statistics Laboratory.** May accompany or follow 441 and 442 respectively. Lab. 1, 3 hr. Credit 1 each course.

451, 452, 453. **Advanced Mathematics for Engineers.** Selected topics of advanced mathematics used in engineering analysis. Prerequisite: 213. Fall, Winter, Spring, respectively. Rec. 3. Credit 3, each course.

490. **History of Mathematics.** Prerequisite: 213 and senior college classification. Winter. Rec. 3. Credit 3.

497. **Teaching Vocational Mathematics in Junior and Senior High Schools.** (Voc. Ed. 497.) Several practical aspects of teaching mathematics such as organization of subject matter, methods of presenting typical topics, and tests for measuring results. Prerequisite: 15 credits of college mathematics. Winter. Lect. and observation 3. Credit 3.

514, 515. **Advanced Calculus.** General derivatives, rationalization, reduction formulas, numerical evaluation of integrals, partial derivatives, line integrals, Green's Theorem with applications to geometry, physics, and mechanics. Prerequisite: 213. Fall, Winter, respectively. Rec. 3. Credit 3 each course. Mr. Smith.

516. **Definite Integrals.** The important integrals which appear in applied mathematics, including the elliptic type. Prerequisite: 213. Spring. Rec. 3. Credit 3. Mr. Gouwens.

535, 536, 537. **Introduction to Modern Geometry.** Synthetic and analytic methods applied to geometry in two or three dimensional space. Prerequisite: 213. Fall, Winter, Spring. Rec. 3. Credit 3 each course. Mr. Robinson.

541, 542, 543. **Mathematical Statistics.** (541) Fundamental concepts, including averages, correlation, moments, distributions, goodness of fit. (542) Mathematical theory of sampling including distributions of statistics and tests of significance. (543) Selected topics such as the Gram-Charlier series, the Pearsonian curves, Lexis theory, likelihood. Prerequisite: 314, 442. Spring, Fall, Winter, respectively. Rec. 3. Credit 3 each course. Mr. Brander.

550. **Vector Analysis as Applied to Physics and Mechanics.** Prerequisite: 213. Rec. 4 or 5. Credit 4 or 5. Mr. Holl.

554, 555. **Analytical Mechanics.** Statics of a particle, force, impulse, momentum, velocity and acceleration, kinetic and potential energy, central forces, harmonic motion, and other topics in theoretical mechanics. Prerequisite: 213. Fall, Winter, respectively. Rec. 3. Credit 3 each course. Mr. Anderson.

599. **Special Topics.** Mr. Smith, Mr. Snedecor.

600. **Finite Groups.** Fundamental theory; algebraic equations; physical applications. Lect. 3. Credit 3. Mr. Allen.

604, 605. **Introduction to Higher Algebra.** Lect. 3. Credit 3 each course. Mr. Robinson.

610. **Seminar.** Messrs. Smith, Snedecor, Holl, Atanasoff.

611, 612, 613. **Theory of Functions.** The theory of functions of a complex variable and an introduction to the theory of functions of a real variable. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course. Mr. Smith.

620. **Calculus of Variations.** Lect. 3. Credit 3. Mr. Gouwens.

621, 622, 623. **Differential Equations of Mathematical Physics.** Fundamental methods of deriving the partial differential equations of mathematical physics and their methods of solution; boundary value problems; advanced problems arising in the solution of certain ordinary differential equations. Prerequisite: 314, Phys. 213. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course. Mr. Hinrichsen.

626, 627. **Integral Equations.** Linear integral equations; applications to physics and biology. Lect. 3. Credit 3 each course. Mr. Allen.

631, 632, 633. **Advanced Geometry.** (631) Co-ordinate geometry and higher plane curves. (632) (633) Differential geometry. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course. Mr. McKelvey.

640. **Probability.** The application of the theory in the solution of scientific and technical problems. Prerequisite: 213. Lect. 3. Credit 3. Mr. Allen.

651, 652, 653. **Introduction to Mathematical Physics.** (Phys. 651, 652, 653.) Basic mathematics used in theoretical physics. Fundamental topics of classical and modern physics using mathematical concepts and methods. Prerequisite: 314, Phys. 504, 516, 595 or equivalent. Fall, Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course. Mr. Atanasoff.

654, 655. **Dynamics.** Motion of a particle and of a rigid body. Prerequisite: 314. Lect. 3. Credit 3 each course. Mr. Holl.

656, 657. **Theoretical Aerodynamics.** Elementary hydrodynamical theory with applications to aeronautics. Lect. 3. Credit 3 each course. Mr. Anderson.

658, 659. **Celestial Mechanics.** Lect. 3. Credit 3 each course. Mr. Hinrichsen.

661, 662, 663. **Mathematics of Elasticity.** (T. & A.M. 661, 662, 663). Two dimensional elastic problems; general stress strain analysis in three dimensions; stability and vibration of beams and columns. Prerequisite: 314. Alternate years. Offered Fall, Winter, Spring, respectively, 1937-38. Lect. 3. Credit 3 each course. Mr. Holl.

666, 667, 668. **Static and Dynamic Problems of Plates and Shells.** (T. & A.M. 666, 667, 668). Thin plate analysis; three dimensional plate problems; shells, stability and vibration of plates and shells. Prerequisite: 314 and permission of instructor. Alternate years. Offered Fall, Winter, Spring, respectively, 1938-39. Lect. 3. Credit 3 each course. Mr. Holl.

674, 675. **Mathematical Theory of Relativity.** Restricted and general theories; tensor analysis; cosmological problems. Prerequisite: 314. Lect. 3. Credit 3 each course. Mr. Allen.

681, 682, 683. **Quantum Mechanics.** (Phys. 681, 682, 683.) Newer developments in the quantum theory and their application to problems in physics and chemistry. Prerequisite: 653 or equivalent. Alternate years. Offered Fall, Winter, Spring, respectively, 1937-38. Lect. 3. Credit 3 each course. Mr. Atanasoff.

699. **Research.** Messrs. Smith, Snedecor, Allen, Atanasoff, Holl, Brandt.

## MECHANICAL ENGINEERING

M. P. CLEGHORN, Head of Department

Professors Bevan, Meeker, Norman; Associate Professors Brówn, Daasch, Hleadley, Hummel, Roudebush; Assistant Professor Nielsen;  
Shop Instructors Breckenridge, Gesser, Maitland

*For information concerning the Division of Engineering, see page 125.*

The professional services performed by Mechanical Engineers vary from the highly scientific work of research and development through the applied work of design and production, to the management, operation, and sales work of industry. These services are rendered in fields ranging from the conversion and utilization of heat, to the development and design of all kinds of machines, and the manufacture of commodities.

The mechanical engineering curriculum is built upon basic scientific and general courses, followed by the professional courses in the study of heat, design, metals, fuels, fluids, and electricity that are the necessary equipment of all mechanical engineers. Opportunity is presented to elect non-professional courses to round out a balanced education.

During the Senior year a part of the work may be chosen from a group of professional courses in some of the specialized fields, such as manufacturing, power generation, aeronautics, air conditioning, and transportation.

Further specialization would be possible only at the expense of basic education, and logically comes from experience and study after graduation.

## Curriculum In Mechanical Engineering

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

For graduate work, see page 158.

For professional degree, see page 144.

## FRESHMAN YEAR

Fall Quarter	Credits <sup>2</sup>	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
College Algebra		Plane Trigonometry		Analytic Geometry	
Math. 101	5	Math. 102C	4	Math. 103	5
Drawing and Projection		Theory of Project. Draw.		Working Drawings	
Engr.Dr. 131	2	Engr.Dr. 132	3	Engr.Dr. 133	3
Engineering Problems		Engineering Problems		Military 103 or 123	1
Gen.Engr. 104	1	Gen.Engr. 105	1		
Military 101 or 121	1	Military 102 or 122	1		
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., M.E. 100 (Spring).

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

Differential Calculus		Integral Calculus		Applied Calculus	
Math. 211	4	Math. 212	4	Math. 213	4
Mechanics and Heat		Elect. and Magnetism		Light and Sound	
Phys. 221	5	Phys. 222	5	Phys. 223	5
Expository Writing		Extempore Speaking		Engineering Problems	
Engl. 204	2	P.S. 311	2	Gen.E. 206	1
Engineering Economics		Properties of Materials		Statics of Engineering	
Ec. 261	3	T.&A.M. 334	2	T.&A.M. 274	3
Metal Shop		Metal Casting		Heat Treat. of Metals	
M.E. 233	3	M.E. 237	4	M.E. 238	4
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

Dynamics of Engineering		Mechanics of Materials		Fuels and Combustion	
T.&A.M. 344	4	T.&A.M. 324	5	M.E. 440	3
Kinematics		Materials Laboratory		Hydraulics	
M.E. 310	4	T.&A.M. 327	1	T.&A.M. 378	4
Advanced Metal Shop		Thermodynamics		Machine Design	
M.E. 341	2	M.E. 344	5	M.E. 315	5
D.C. Machines		A.C. Circuits		A.C. Machines	
E.E. 338	3	E.E. 339	3	E.E. 340	3
Electrical Laboratory		Electrical Laboratory		Electrical Laboratory	
E.E. 348	1	E.E. 349	1	E.E. 350	1
		†Scientific Papers		†American Government	
		Engl. 414	3	Govt. 315	3
*Electives	3				
	17		18		19

\*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

†May be omitted by students appointed to the Reserve Officers' Training Corps, see page 301.

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Heat Engines		Internal Combust. Engines		Engineering Contracts	
M.E. 444	5	M.E. 445	4	Engr. 405	3
Industrial Organizations		Stresses in Machines		Dynamics of Machinery	
M.E. 484	3	M.E. 416	3	M.E. 418	3
Fluid Mechanics		Engineering Valuation		Accounting	
M.E. 414	3	Engr. 407	3	Ec. 374	4
*Electives	7	Electives	7	Electives	8
	<u>18</u>		<u>17</u>		<u>18</u>

In addition to the courses listed above, each student will be required to include in his schedule: Inspection Trip, M.E. 400 (Fall).

**SENIOR ELECTIVES:** Not less than 12 credits shall be chosen from the following:

Heating and Ventilation		Steam Power Plants		Refrigeration and Air	
M.E. 424	4	M.E. 448	4	Conditioning	
Aerodynamics of Airplanes		Industrial Metallurgy		M.E. 426	4
M.E. 410	4	M.E. 435	4	Airplane Design	
				M.E. 415	4
Machine Tools		Industrial Engineering		Automotive Engine Design	
M.E. 434	4	M.E. 486	3	M.E. 429	4
Automotive Transportation		Airplane Structures		Adv. Airplane Structures	
M.E. 428	3	M.E. 420	4	M.E. 425	3
Time Studies		Automotive Engineering		Factory Planning	
M.E. 455	2	M.E. 430	3	M.E. 489	3

The remaining 9 credits of electives in the Senior year may be taken in Military or in other subjects if a definite objective is shown.

## Description of Courses

**100 Technical Lecture.** The field of Mechanical Engineering, its opportunities and requirements. One lecture a week. Spring. Required.

**231 Pipe Fitting.** Principles and practice of threaded, flanged, leaded, and welded pipe joints and fittings. For Chem. Engrs. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1.

**232 Machine Work.** Principles and practice of machine working of metals. Fall, Winter, Spring. Lab. 3, 3 hr. Credit 3.

**233 Metal Shop.** Principles and practice of machine tool and bench working of metals. Forming and fabrication of steels, cast irons, and non-ferrous metals. Fall, Winter, Spring. Lab. 3, 3 hr. Credit 3.

**237. Metal Casting.** Ferrous and non-ferrous molding and casting. Study of processes and equipment. Specifications, control, and testing of products. Prerequisite. Chem. 103. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

**238 Heat Treatment of Metals.** Heat treatment of carbon and alloy steels, non-ferrous metals, and special alloys. Inspection of tests of heat treated metals. Engineering specifications and control. Prerequisite. Chem. 103. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

**239 Metallurgy.** Processing and properties of cast and rolled metals and the effects of heat treatment. For electrical engineers. Prerequisite: Chem. 103. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

**310. Kinematics.** Cams, linkages, principles of gearing. Analytical and graphical study of velocities and accelerations of engine and machine parts. Prerequisite. Engr. Dr. 131, credit or classification in T. & A. M. 344. Fall, Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

**315 Machine Design.** Design of fastenings, pressure vessels, shafts, gearing, belting, clutches. Bearings and lubrication. Prerequisite: T. & A. M. 324. Fall, Spring. Rec. 3. Lab. 2, 3 hr. Credit 5.

**341 Advanced Metal Shop.** Tool material and shapes, cutting speed, power requirements. Prerequisite 233, 238. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

**344 Thermodynamics.** The properties and fundamental equations of gases and vapors. Thermodynamics of heat cycles, air compressors, and steam engines. Prerequisite: Math 212. Phys 221. Fall, Winter, Spring. Rec. 4. Lab. 1, 3 hr. Credit 5.

354. **Power Measurement Laboratory.** Practice in calibration of instruments; power measurement. For students with no thermodynamics. Prerequisite: Phys. 221, 222. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1.
400. **Inspection Trip.** Inspection trips to industrial centers. Prerequisite: Senior classification. Fall.
407. **Mechanical Equipment of Buildings.** The selection, layout, and specifications of the heating, ventilating, cooling, and elevator equipment of buildings. For architectural engineers. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.
409. **Mechanical Equipment of Buildings.** A continuation of 407. Winter. Rec. 1. Lab. 2, 3 hr. Credit 3.
410. **Aerodynamics of Airplanes** Lift and drag characteristics of airfoils; parasite resistance, propellers, performance, altitude effects, stability, and control. Prerequisite: T. & A. M. 344. Fall. Rec. 4. Credit 4.
414. **Fluid Mechanics.** Flow of liquids, gases, and vapors; dimensional analysis, viscous and turbulent flow, velocity measurement, discharge of nozzles, characteristics of blowers. Prerequisite: 344, T. & A. M. 378. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.
415. **Airplane Design.** Stress analysis of wing, fuselage, and landing structures of airplanes. Department of Commerce requirements. Prerequisite: 410, 420. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.
416. **Stresses in Machines.** Calculations of stresses in such machine parts as heavy springs, machine frames, crankshafts, thick-walled cylinders, and rotating discs. Prerequisite: 315. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.
418. **Dynamics of Machinery.** Calculation of periodic forces and torques in engines and machines, and the torsional and transverse vibrations caused by them. Flywheels, governors, and speed regulation. Prerequisite: 310, 315. Spring. Rec. 3. Credit 3.
420. **Airplane Structures.** General airplane design procedure; analysis of forces by analytical and graphical methods and calculation of stresses in airplane parts; study of continuous beams under combined axial and lateral loads by precise methods, form factors and shape effects. Prerequisite: T. & A. M. 324. Winter. Rec. 4. Credit 4.
424. **Heating and Ventilation.** Theory, design, and layout of heating systems. The study of boilers, water heaters, ventilation, air analysis, and temperature control apparatus. Prerequisite: 344. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.
425. **Advanced Airplane Structures.** Deflections, statically indeterminate structures, wing and fuselage structures, monocoque construction, loads upon an airplane. Prerequisite: 420. Spring. Rec. 3. Credit 3.
426. **Refrigeration and Air Conditioning.** Principles of refrigeration. The simultaneous control of temperature, humidity, and motion of air in buildings. Purification of air. Prerequisite: 424. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.
428. **Automotive Transportation.** Automobile, bus, and truck transportation. Operating costs. Choice of equipment. Fleet operation. Operating and maintenance problems. Prerequisite: T. & A. M. 344. Fall. Rec. 3. Credit 3.
429. **Automotive Engine Design.** Problems in design and layout of high-speed engines of carburetion and Diesel types. Prerequisite: 445. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.
430. **Automotive Engineering.** Power requirements of automobiles, busses, and trucks. Calculation of speed, acceleration, fuel consumption, braking and tractive efforts. Comparison of carburetion-engined and Diesel-engined vehicles. Prerequisite: 444. Winter. Rec. 3. Credit 3.
434. **Machine Tools.** The design and performance of machine tools. Production methods and development of special tools, jigs, and fixtures. Prerequisite: 237, 238, 310, 315. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.
435. **Industrial Metallurgy.** Mechanical and thermal problems in the processing of industrial metals. Prerequisite: 440. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.
440. **Fuels and Combustion.** Composition, properties, and combustion of fuels; fuel, gas, and lubricant testing. Prerequisite: 344. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.
444. **Heat Engines.** The thermodynamics and performance of steam engines, turbines, gas compressors, and refrigeration machines. Reheating, regenerative, and binary cycles. Prerequisite: 344, 440. Fall. Rec. 4. Lab. 1, 3 hr. Credit 5.
445. **Internal Combustion Engines.** Thermodynamics and performance of gasoline and oil engines. Carburetion and fuel injection. Prerequisite: 440, 444. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

**448. Steam Power Plants.** Principal and auxiliary equipment for power, heating, and pumping plants. Cooling towers, boiler water treatment, principles of plant design. Prerequisite: 440, 444. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

**455. Time Studies.** Elements of production operations, quality of labor, time required, arrangement of equipment. Prerequisite: Credit or classification in 484. Fall, Winter, Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

**466. Power Plant Engineering.** Combustion of fuels; steam and Diesel prime movers; mechanical equipment of power, heating, and pumping plants; power costs. For electrical engineering seniors. Prerequisite: 344. Fall. Rec. 5. Lab. 1, 3 hr. Credit 6.

**467. Diesel Engines.** Practical study of the Diesel engine. Consideration of fuel injection, air supply, cooling and exhaust systems. Thermal study and determination of engine characteristics. Prerequisite: 344, senior classification. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

**484. Industrial Organization.** Industrial tendencies, ownership; types of organization, executive control; wage systems, time studies, inspection methods, employment problems, labor turnover, personnel work, industrial relations. Prerequisite: Ec. 261. Fall, Winter. Lect. and rec. 3. Credit 3.

**486. Industrial Engineering.** Factory location and operation, orders and records, purchasing, storing, routing, scheduling, dispatching, costing, general management theories. Prerequisite: 484. Winter, Spring. Rec. 3. Credit 3.

**487. Special Problems.** Investigation on a topic holding special interest of student. Comprehensive report required. Election of the course, and the topic, must be approved by the head of the department. Prerequisite: Senior classification. Credit 3 to 5 any quarter; maximum credit 9.

**489. Factory Planning.** Selection and layout of machinery, power apparatus, heating, ventilating, and lighting systems; size and type of buildings. Prerequisite: 424. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

**600. Advanced Machine Design.** Mathematical and experimental analysis of problems in the field of dynamics of machinery, stress analysis, and vibration. The choice of work any quarter determined by the aptitudes and interests of the class. Mr. Norman.

**624. Aerodynamics.** Circulation and vortex theory of airfoils; airfoil characteristics; wind tunnel interference and scale effects; propellor theory. Fall. Credit 3 to 5. Mr. Bevan.

**626. Airplane Performance and Stability.** Calculation of airplane performance and economy at sea level and high altitudes. Calculations of stability and control. Spring. Credit 3 to 5. Mr. Bevan.

**640. Industrial Heating and Air Conditioning.** Theory and practice of plant and industrial heating, ventilation, and air conditioning. Fall. Credit 3 to 5. Mr. Norman.

**645. Applied Thermodynamics.** Thermal analysis and performance of steam engines, turbines, compressors, refrigeration machinery; heat generation and absorption. Fall, Winter. Credit 3 to 5. Mr. Cleghorn, Mr. Norman.

**647. Internal Combustion Engines.** Thermal analysis, performance, and design of internal combustion engines. Winter. Credit 3 to 5. Mr. Bevan, Mr. Brown.

**655. Research.** Messrs. Mecker, Cleghorn, Norman, Roudebush, Bevan, Hummel, Daasch, Brown, Nielsen.

**678. Central Stations.** Location and types; choice and arrangement of apparatus; coal conveying and storage systems. Power costs. Spring. Credit 3 to 5. Mr. Cleghorn.

**685. Factory Personnel.** Employment departments; time and wage problems; shop-committees; housing conditions and industrial relations. Fall. Credit 3 to 5. Mr. Roudebush.

**688. Manufacturing Costs.** Overhead and prime costs; machine-hour rate in distributing burden; departmental reports; graphical analysis. Fall, Winter, Spring. Credit 3 to 5. Mr. Roudebush.

## MILITARY SCIENCE AND TACTICS

LT. COL. HERBERT R. ODELL, Head of Department

Associate Professors Major Matlack, Major Skerry; Assistant Professors Capt. Berkey, Capt. Lewis, Capt. Storke, Capt. Van Giesen, Capt. Wood

*For information concerning the Division of Industrial Science, see page 131.*

Under the provisions of the National Defense Act, Iowa State College has secured from the United States Government authorization for the establishment of two units of the Reserve Officers' Training Corps, namely, Engineer and Field Artillery.

The primary object of the Reserve Officers' Training Corps is to train selected students so that they may qualify for appointment as reserve officers in the Army of the United States. The training given will not only place the student in a position to be of service to his country in a national emergency, but will be valuable to him in his industrial or professional career.

The four-year course is divided into two parts. The first two years are known as the Basic Course and the last two as the Advanced Course.

**CLASSIFICATION OF STUDENTS.** A limited number of students taking Engineering are classified in the Engineer Unit; all others in the Field Artillery Unit.

**BASIC COURSE.** The Basic Course is required by the College as a prerequisite to graduation, of all physically fit male students who are citizens of the United States. Students who are excused from Military Science on account of physical disability must elect six credits of other work to take the place of Military Science. Upon the successful completion of the Basic Course the student may be enrolled in the Advanced Course, provided his application is approved by the Professor of Military Science and Tactics and the President.

**ADVANCED COURSE.** In the Junior and Senior years of some collegiate curricula given in the catalogue, certain courses are marked with a dagger (†). If a student is enrolled in the Reserve Officers' Training Corps, he may omit all or part of the courses thus marked, in each quarter, provided that in omitting these courses he does not omit more credit hours than the Reserve Officers' Training Corps requires of him for the same quarter. If the omitted courses would exceed the number of hours required for the Training Corps, an elective must be taken which will bring the total number of hours for the quarter up to the requirements specified for that quarter in that curriculum.

Members of the Basic Course have their uniforms furnished by the Government; the uniform for the Engineer Unit consists of one cap, wool, overseas; one pair of chevrons and other sleeve insignia; one coat, wool, olive drab, with lapel of sky blue (blue dress trousers shade); one cravat or black tie; one insignia, collar, set; one shirt, flannel or cotton, olive drab; one pair trousers, wool; and one waist belt. The uniform for the Field Artillery Unit consists of one pair breeches, wool; one cap, wool, overseas; one pair of chevrons and other sleeve insignia; one coat, wool, olive drab, with lapel of sky blue (blue dress trousers shade); one cravat or black tie; one insignia, collar, set; one leggins, mounted; one shirt, flannel or cotton, olive drab; and one waist belt.

Members of the Advanced Course are allowed a cash commutation for the purchase of a tailor-made uniform. This is intended to cover the cost of a cap, coat, breeches, woolen shirt, and leather belt. Advanced Course students are also paid commutation of rations throughout the year, except for the 42 days they are at a required Summer Camp. At Camp, they receive the pay of a soldier of the seventh grade, free rations, medical attention, and five cents per mile travel allowance to camp and return, from the place from which they were authorized to proceed.

## Description of Courses

### ENGINEER

101, 102, 103. Organization of the Army; military discipline, courtesy and customs of service; military sanitation and first aid; national defense act; military history and policy; military obligations of citizenship; current international situation; leadership; rifle marksmanship; weapons and musketry; scouting and patrolling. Fall, Winter, Spring, respectively. Lecture 1. Drills 2. Credit 1 each course.

201, 202, 203. Organization and duties of engineers; map and aerial photograph reading; military sketching; map making; rigging; leadership and command; scouting and patrolling; combat principles, the rifle squad. Fall, Winter, Spring, respectively. Lecture 1. Drills 2. Credit 1 each course.

301, 302, 303. Interior guard duty; care of animals and stable management; military roads, location and construction; military roads, maintenance and repair; military bridging, general; military bridging, floating bridges; military explosives and demolitions; field fortifications, trenches; field fortifications, emplacements; field fortifications, obstacles; field fortifications, protected shelters; combat orders and solution of problems, engineer; combat principles of infantry units; combat principles of engineer units; mechanization; leadership; military bridges, fixed. Fall, Winter, Spring, respectively. Lectures 2. Drills 3. Credit 3 each course.

401, 402, 403. Supply and mess management; emergency procurement and funds; organization and duties of engineers; construction in war; fixed bridges; combat principles, the company; organization of the ground; defense against chemical warfare; the law of military offenses; courts-martial; administration; military history and policy; leadership. Fall, Winter, Spring, respectively. Lectures 2. Drills 3. Credit 3 each course.

### FIELD ARTILLERY

121, 122, 123. **Military Fundamentals:** Orientation, national defense act and R. O. T. C.; obligations of citizenship; military history and policy; current international situation; military discipline, customs and courtesy of service; military sanitation and first aid; military organizations and organization of the field artillery. Leadership (Practical drills). Field artillery instruction: Elementary gunnery; duties of cannoneers and firing battery; field artillery ammunition and material. Fall, Winter, Spring, respectively. Lecture 1. Drills 2. Credit 1 each course.

221, 222, 223. Leadership. Transport: Care of animals, stable management; equitation; driving and draft. Field artillery instruction: Fire control instruments; map and aerial photograph reading; battery communications; battery detail and reconnaissance, selection and occupation of position. Fall, Winter, Spring, respectively. Lecture 1. Drills 2. Credit 1 each course.

321, 322, 323. Leadership. Gunnery: Elementary ballistics and dispersion; preparation of fire; conduct of fire. Reconnaissance, selection and occupation of position: Duties of battery officers; the battery detail; field artillery communications; liaison with infantry. Transport: Equitation; driving and draft; automotive vehicles. Pistol marksmanship. Fall, Winter, Spring, respectively. Lectures 2. Drills 3. Credit 3 each course.

421, 422, 423. Leadership: Command and instruction student organizations; transport (animal). Tactics: military history and policy; military law and administration. Fall, Winter, Spring, respectively. Lectures 2. Drills 3. Credit 3 each course.



## MINING ENGINEERING

See page 200.

## MODERN LANGUAGES

LOUIS DE VRIES, Head of Department

Assistant Professors Kehlenbeck, Marlow

*For information concerning the Division of Industrial Science, see page 131.*

Regular elementary work is offered in French, German, and Spanish. Students in the Division of Industrial Science are required to study either French or German, while students from other divisions may elect whatever language they prefer.

Courses in Reading Knowledge of French and German are offered to students in Chemical Technology; these courses are also elected by senior college students of the other divisions who desire to become acquainted with the literature in their field; the courses were originally designed for graduate students who wanted to learn to read French and German as rapidly as possible, so that they might have access to the foreign literature in their research work. Emphasis is constantly placed on accurate translation. A knowledge of the foreign literature may avoid duplication of work done abroad.

A foreign language is not only a useful tool for the expressing and gathering of ideas, but the study of the literature, culture, and institutions of a foreign people, broadens one's intellectual horizon, and increases one's human sympathy and understanding, a development which American students especially need.

## Description of Courses

201, 202, 203. **Elementary French.** Principles of pronunciation; grammar; reading of modern prose. Fall, Winter, Spring. Rec. 3 to 5. Credit 3 to 5 each course.

231, 232, 233. **Elementary German.** Grammar, reading, composition and conversation. Fall, Winter, Spring. Rec. 3 to 5. Credit 3 to 5 each course.

261, 262, 263. **\*Elementary Spanish.** Grammar, reading, composition, and conversation. Fall, Winter, Spring. Rec. 2 to 5. Credit 2 to 5 each course.

301, 302, 303. **Intermediate French.** Reading of modern French prose, plays, and some verse; grammar review and composition; conversation. Prerequisite: 203. Rec. 3 to 5. Credit 3 to 5 each course.

311, 312, 313. **Contemporary French Literature.** Prerequisite: 203. Rec. 2 to 4. Credit 2 to 4 each course.

316. **Scientific French.** Selected readings in physical, chemical, biological, and geological subjects. Prerequisite: 203 or equivalent. Rec. 3. Credit 3.

331, 332, 333. **Selected German Reading.** Prose reading followed by a drama. Prerequisite: 233. Rec. 3 or 4 each course.

341, 342, 343. **Scientific German.** Selected readings in physical, chemical, biological and geological subjects. Prerequisite: 233 or equivalent. Rec. 3. Credit 3.

361, 362, 363. **\*Intermediate Spanish.** Reading of modern Spanish prose; grammar review and composition; conversation. Prerequisite: 263. Rec. 2 to 4. Credit 2 to 4 each course.

\*May not be offered 1937-38.

371, 372, 373. \*Commercial Spanish. Reading of Spanish-American commercial literature. Writing commercial letters and reports. Conversation. Prerequisite: 263. Rec. 3. Credit 3 each course.

441, 442, 443. Reading Knowledge of German. No prerequisite. Credit 2 to 4. quarter for undergraduates. May be taken by graduate students without credit.

411, 412, 413. Reading Knowledge of French. No prerequisite. Credit 2 to 4 each each quarter for undergraduates. May be taken by graduate students without credit.

## MUSIC

TOLBERT MACRAE, Head of Department

Assistant Professor Edgar; Instructors Chase, Cook, Niemack, Schroeder

*For information concerning the Division of Industrial Science, see page 131.*

The aim of the Department of Music is to afford students who have interest in music a means of developing their musical ability. An opportunity is offered for active participation in various branches of music according to the interest of the individual.

The Department of Music is housed in a brick building, situated near the center of the campus. This building contains teaching studios and practice rooms. Each practice room is equipped with a piano and is well lighted. Rehearsals of the various musical organizations are held in Music Hall, and in Morrill Hall.

### Description of Courses

Iowa State College Festival Chorus. Glee Clubs. All members of the student body and the faculty are eligible. Interpretation of choral work, secular and sacred.

101, 102, 103. Harmony. Ear training and sight reading. Course designed to teach pupils scales, intervals, chords, and rhythms used in composition. Each course is two periods weekly. This will prepare students for writing melodies and making their own harmonization without use of piano or other instrument and should prepare them to do sight reading either instrumental or vocal. Credit 1 each course. See page 349 for fee.

111, 112, 113. Band. Open to all students by competitive examination. Concerts are given by the organization in addition to playing for convocations and for athletic events. Members doing satisfactory work receive 1 credit per course.

121, 122, 123. Training Band. Open to all students by competitive examination. Work done in this band is preparatory to entrance to the concert band. Members will play at athletic events.

141, 142, 143. Glee Club. (Men and women.) Open to all students by competitive examination. The clubs give several concerts each year and assist at college functions. Three rehearsals are required each week. Members doing satisfactory work will receive one credit each course.

144. Music Appreciation. Designed to acquaint the students with the form and meaning of good music. Lectures demonstrated by musical selections. Open to all students. Fall, Winter, Spring. Rec. 2. Credit 1.

151, 152, 153. Orchestra. Designed for students who have made a beginning on an orchestral instrument. Standard orchestral works are given in concert during the year. Fall, Winter, Spring, respectively. Credit 1 each course.

311, 312, 313. Private Music Lessons. Open to all students. Satisfactory work being done in private instruction in any branch of music will be given one credit each course. See page 349 for fee.

\*May not be offered in 1937-38.

361, 362, 363 **Conducting.** Prepares the student to conduct band, orchestra, or choral club. Major emphasis on technique of conducting; also includes the principles of playing the various instruments, substitution of instruments, choosing voices for choral work, rehearsal methods, and other problems. Fall, Winter, Spring. Demonstration and lab. Credit 1. See page 349 for fee. Prerequisite: permission of head of the department.

Not more than 8 total credits in music will be allowed toward graduation.

## PHYSICAL EDUCATION (For Men)

G. F. VEENKER, Head of Department

Associate Professors Menze, Otopalik, Simpson; Assistant Professors, Daubert, Schmidt, Truskowski, Yeager; Instructor Timm

*For information concerning the Division of Industrial Science, see page 131.*

The work of the department includes required courses for Freshmen and Sophomores, elective courses for upperclassmen, intramural athletics, and intercollegiate athletics. The department is committed to the principle that its work should be mainly for the many rather than the few, and that the development of special teams is of secondary importance to the development of the student body as a whole.

THE REQUIRED COURSES for Freshmen and Sophomores aim to remedy common physical defects, with special attention to faulty posture, to foster a condition of vigorous health and proper health habits, and to give a fundamental training which will develop motor skill, endurance, strength, self-control, and self-confidence. It is intended also to give a knowledge of and an interest in forms of physical activity in which one can participate after graduation, as well as during the later years of college life.

Through the intramural athletics, every man is given an opportunity and an incentive to participate in competitive athletics. The intramural program includes football, touch football, softball, basketball, volleyball, wrestling, tennis, indoor and outdoor track, handball, horseshoe pitching, baseball, golf, archery, fencing, hockey, table tennis, and swimming.

INTERCOLLEGIATE ATHLETICS are under the control of the Athletic Council. The Iowa State College is a member of the Missouri Valley Intercollegiate Athletic Association and the intercollegiate athletics are subject to the rules of this conference.

The College is also a member of the National Collegiate Athletic Association and is committed to tolerate only clean and wholesome sport and to promote good sportsmanship among contestants and spectators. The College is represented by intercollegiate teams in football, cross country, basketball, wrestling, swimming, indoor and outdoor track, baseball, tennis, golf, and polo.

### Curriculum In Industrial Science—Major In Physical Education (in combination with another major)

Athletic coaches and teachers of Physical Education in Iowa high schools are usually required to teach some academic subject in addition

to their athletic work. The department offers a Major in Physical Education combined with a Major in another Industrial Science Department.

For the Freshman and Sophomore years see page 285.

For general instructions as to Junior and Senior work, see page 286.

### Description of Courses

101, 102, 103. **Physical Education.** Mass activities, corrective exercises, swimming, athletics and games. Fall, Winter, Spring, respectively. Lab. 2, 1 hr. Required each course.

101C, 102C, 103C. **Individual Physical Education.** On recommendation of the Hygiene Department in substitution for 101, 102, 103. Fall, Winter, Spring, respectively. Lab. 2, 1 hr. each course.

106, 107, 108. **First Aid and Safety.** (106) First aid to the injured. Open to men and women. The First Aid Certificate of the American Red Cross will be given to those who satisfactorily complete this course. Spring. (107) Advanced first aid and safety. (108) Teacher training in first aid and safety. Lect. 2. Credit 2 each course.

201, 202, 203. **Physical Education.** Advanced work. Prerequisite: 101, 102, 103. Fall, Winter, Spring, respectively. Lab. 1, 1 hr. Required each course.

201C, 202C, 203C. **Individual Physical Education.** On recommendation of the Hygiene Department in substitution for 201, 202, 203. Fall, Winter, Spring. Lab. 1, 1 hr. each course.

304, 305, 306. **Physical Education Technique.** Instruction and practice in fundamental skills of physical education activities. (304) Football. Fall. (305) Basketball. Winter. (306) Track. Spring. Lab. 6. Credit 2 each course.

309. **Athletic Training.** Principles governing conditioning for various sports; diet, sleep, bathing, massage; overtraining; prevention and care of injuries. Prerequisite: 201, 202, 203. Spring. Rec. 2. Credit 2.

314, 315, 316, 317. **Coaching of Athletic Sports.** History, rules, theory, coaching methods. Prerequisite: 201, 202, 203. (314) Football. Winter. (315) Basketball. Winter. (316) Track. Spring. (317) Baseball. Alternate years. Offered Spring, 1939. Lecture and demonstration 3. Credit 2 each course.

411, 412, 413. **Supervised Teaching in Physical Education.** (Voc. Ed. 411, 412, 413.) Practice with school and college groups. Fall, Winter, Spring, respectively. Lab. 6. Credit 1 or 2 each course.

424. **Special Topics.** Credit 2. Hours as arranged.

491. **Principles of Physical Education.** (Voc. Ed. 491.) Interpretation of objectives of physical education and health education. Analysis of activities in terms of developmental objectives. Prerequisite: Zool. 255, Voc. Ed. 304. Alternate years. Offered Fall, 1937. Rec. 3. Credit 3.

492. **Methods of Teaching Physical Education.** (Voc. Ed. 492.) Application of general education methods to physical education. Special methods of teaching activities not covered in 314, 315, 316, 317. Prerequisite: Psych. 334, 335. Alternate years. Offered Winter, 1938. Rec. 3. Credit 3.

493. **Organization and Administration.** (Voc. Ed. 493.) Organization and administration of physical education and athletics. Program for required and elective courses, intramural and interschool athletics. Athletic management. Prerequisite: 201, 202, 203. Alternate years. Offered Spring, 1938. Lect. 3. Credit 3.

## PHYSICAL EDUCATION (For Women)

WINIFRED R. TILDEN, Head of Department

Assistant Professor Foster; Instructors Brownlee, Hassinger,  
Hopkins, Moorehouse

*For information concerning the Division of Industrial Science, see page 131.*

Two years of Physical Education are required of all women students in three one-hour periods. Classification in any of the courses listed in

the group which may be taken for the required work will be determined by the abilities and skills of each student.

**PHYSICAL EXAMINATION.** After matriculation each student has a physical examination and has her silhouettegraph taken. The type of work permitted will depend upon the result of these examinations.

**INDIVIDUAL PHYSICAL EDUCATION.** Those students whose physical examinations and silhouettegraphs indicate they should be restricted in some activity will be assigned to Individual Physical Education, and will remain so classified until released from the restrictions. The Department of Hygiene co-operates closely with the Department of Physical Education in making these assignments.

**SWIMMING.** Every student is required to pass a swimming test (Phys. Ed. 400) before her graduation unless excused by the College Physician or Head of the Physical Education Department. Opportunity for advanced swimming is given in the Women's Athletic Association, Red Cross Life Saving Corps and the honorary swimming club—The Naiads.

**WOMEN'S ATHLETIC ASSOCIATION.** The Women's Athletic Association is affiliated with the Athletic Federation of College Women, the National Field Hockey Association and the Women's Division of the National Amateur Athletic Federation.

**INTRAMURALS.** Intramural activities, volleyball, ring toss, archery, badminton, basketball, swimming, and ping pong, are offered to the girls in all houses and dormitories who like to participate in some sport after four o'clock in the afternoon. The enjoyment derived is its reward.

**UNIFORMS.** The uniforms shall consist of a one-piece sleeveless romper suit of any color and of any washable material, white tennis shoes and socks. This may be used for all physical education activities except swimming. For swimming, a cotton tank suit, any color except red, and a bathing cap are required. These articles may be purchased before or after matriculation.

**THE REQUIRED COURSES** have a three-fold purpose: (1), to correct common physical defects; (2), to develop co-ordination and bodily control; and (3), to give each student a fundamental training in motor skills and abilities which she may use for her own enjoyment and development and for those with whom she may work and live.

### Description of Courses

Six quarters of work from courses 121, 122, 123, 221, 222, 223, may be chosen for the required work. One credit will be given for each three quarters of the required courses.

\*121, 122, 123; 221, 222, 223. **Physical Education.** \*\*Elementary rhythm; folk dancing and games; natural dancing; tap dancing; archery; badminton; basketball; golf; hockey; deck tennis; \*\*swimming; life saving; tennis; volley ball.

121C, 122C, 123C; 221C, 222C, 223C. **Individual Physical Education.** On recommendation of the department of Hygiene and Physical Education in substitution for 121, 122, 123; 221, 222, 223.

400. **Swimming Test.** Required of all women for graduation unless excused by the College Physician or the Head of the Department of Physical Education.

\*121, 122, 123 refer to the first year of required work, 221, 222, 223 to the second year.

\*\*To be chosen if unable to pass the proficiency test.

### Elective Credit Courses

106. **First Aid.** See Physical Education for Men, page 306.

324. **Physical Education.** Any activity in 121, 122, 123 may be taken for 1 credit if the activity has not been taken as a required course.

326. **Recreational Leadership and Camp Fire.** History, administration and program of recreation and the Camp Fire Girls organization. Discussion and practice of the activities included in each program. Prerequisite: three quarters of required physical education or equivalent. Spring. Lect. 2, Lab. 1, 3 hr. Credit 3.

327. (Voc. Ed. 327.) **Theory and Practice of Coaching.** Survey of coaching field. Coaching technique and officiating. Application of rules, plays and coaching principles. Alternate years. Offered Winter, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3.

328. (Voc. Ed. 328.) **Special Problems in Teaching Physical Education.** Alternate years. Offered Winter, 1939. Lect. 2. Lab. 1, 3 hr. Credit 3.

## PHYSICS

J. W. WOODROW, Head of Department

Professors Fox, Spinney; Associate Professors Atanasoff, Carr, Kunerth, Plagge, Stiles; Assistant Professors Benedict, Butler, McCracken, Richards, Willson; Instructors Miller, Pinney; Fellows Burdine, Goodwin, Hart, Higgins, McCoy, Ryan, Stebbins; Instrument Maker Larsen; Technician Baughman

*For information concerning the Division of Industrial Science, see page 131.*

The Physics building has been designed and constructed to meet the special requirements of lecture, class room and laboratory work in physics. It provides more than fifty thousand square feet of floor area and is equipped with modern conveniences and facilities for instruction and investigation in this field.

### Curriculum In Industrial Science—Major Physics

For the Freshman and Sophomore years, see page 285.

For general instructions as to senior college work, see page 286.

### Description of Courses

106. **Physics for Home Economics Students.** The principles of physics as applied to the home. Fall, Winter, Spring. Lect. 2. Rec. 2. Lab. 1, 3 hr. Credit 4.

204. **Physics for Agricultural Students.** The various kinds of energy involved in plant and animal production and some of the newer methods of energy control. Prerequisite: Math. 102, 205, or 241. Fall, Winter, Spring. Lect. 2. Rec. 1. Credit 3.

211, 212, 213. **General Physics.** For students in Industrial Science. Prerequisite: Math. 102. Fall, Winter, Spring, respectively. Lect. and rec. 3. Lab. 1, 2 hr. Credit 4 each course.

221, 222, 223. **General Physics.** For Engineering students. Mechanics, heat, magnetism, electricity, sound, and light. Prerequisite: Math. 102. (221) Fall, Winter. (222) Winter, Spring. (223) Spring, Fall. Rec. and demonstration 4. Lab. 1, 2 hr. Credit 5 each course.

301, 302, 303. **General Physics.** For Home Economics students. An advanced course in fundamental physics with special applications to household problems. Sufficiently fundamental to afford thorough training for teachers. Prerequisite: H. Eq. 154. Fall, Winter, Spring, respectively. Lect. 1. Rec. 2. Lab. 1, 3 hr. Credit 4 each course.

311, 312, 313. **Physical Measurements.** Precise measurements. (311) Mechanics. (312) Heat, optics, and electricity. (313) Electricity. Prerequisite: 213 or 223, Math. 213. Fall, Winter, Spring, respectively. Lab. 1, 3 hr. Credit 1 each course.

316. **Photography.** Methods and practices in photography. Composition and lighting. Corrective treatment of negatives. Printing. Prerequisite: 204, Chem. 103, or their equivalents. Fall, Spring. Lect. and rec. 1. Lab. 2, 3 hr. Credit 3.

321, 322, 323. **Advanced General Physics.** Mechanics, heat, optics, and electricity. Prerequisite: 213 or 223, Math. 213, Chem. 103. Fall, Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course.

404. **History of Physics.** Prerequisite: 213 or 223. Spring. Credit 2.

405. **Laboratory Glassblowing.** Exercises with the table blast lamp selected to include operations fundamental to the making of laboratory glassware. Methods of cutting tubing. Demonstrations with Pyrex. Prerequisite: senior college classification. Fall, Winter, Spring. Lab. 2, 1½ hr. Credit 1.

415. **Advanced Glassblowing.** Seals not included in 405. Work with Pyrex and special glasses. Ground joints, stopcocks, manometers, vacuum apparatus, and electrical glassware. Construction and use of electric furnaces for annealing glass and for other laboratory purposes. Prerequisite: 405. Fall, Winter, Spring. Credit 1 to 3.

450. **Advanced Physics Laboratory.** Prerequisite: 313, or equivalent. Fall, Winter, Spring. Credit 1 to 9 in any one year.

498. **Teaching of Physics.** (Voc. Ed. 498.) A technique course. To acquaint prospective teachers with the recent educational advances in methods as they apply to the teaching of physics. A study of the content of the high school physics, and practice in presentation of various topics. Prerequisite: 15 credits of physics, including 211, 212, 213, or equivalent. Winter. Lect. and rec. 3. Credit 3.

501, 502, 503. **Industrial Physics.** Discussion of recent physics research as applied to industrial problems. The current topic is the thermionic vacuum tube. Prerequisite: 213, Math. 213. Fall, Winter, Spring, respectively. Lect. and rec. 2. Credit 2 each course. Mr. Richards.

504. **Heat.** Temperature, expansion, specific heat, convection, conduction, gas laws, kinetic theory, change of state, radiation, isothermal and adiabatic changes, measurements of high and low temperatures. Prerequisite: 213 or 223, Math. 213. Spring. Lect. and rec. 3. Lab. 0 or 1, 3 hr. Credit 3 or 4. Mr. Kunerth.

505, 506. **Wave-Motion and Sound.** General theory of wave-motion and vibrating systems, resonance and interference; physical characteristics of some musical instruments; acoustics of speech and hearing; measurement of sound absorption; acoustic correction of auditoriums. Prerequisite: 213 or 223, Math. 213. Winter, Spring, respectively. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3 each course. Mr. Plagge.

514. **Geometrical Optics.** Optical constants of mirrors and lenses, image formation, vision through a lens, aberrations, optical instruments, lens combinations. Prerequisite: 213 or 223, Math. 213. Fall. Lect. and rec. 3. Lab. 0 or 1, 3 hr. Credit 3 or 4. Mr. Kunerth.

515. **Illumination.** Illuminants, methods of production of light, photometry, illumination measurements, lighting design, brightness, glare, color, the eye, practical applications. Prerequisite: 223, 313. Winter. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3. Mr. Kunerth.

516. **Physical Optics.** Wave theory, absorption, dispersion, interference, diffraction, gratings, resolving power, polarization. Prerequisite: 213 or 223, Math. 213. Winter. Lect. and rec. 3. Lab. 0 or 1, 3 hr. Credit 3 or 4. Mr. Kunerth.

519, 520. **Modern Experimental Physics.** (519) Physical units, theory of measurements, formulation of physical equations. Measurement of electronic mass and charge. Fall. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3. (520) Special problems in electron phenomena, conduction of electricity through gases, and spectroscopy. Prerequisite: 313, 405, or equivalents, and permission of the instructor. Winter. Lect. and rec. 1. Lab. 2, 3 hr. Credit 3. Mr. Pinney.

524, 525. **Biophysics.** Electromagnetic waves and other physical phenomena and their relation to plant and animal life. Prerequisite: 213 or 223. Winter, Spring, respectively. Rec. 3. Credit 3 each course. Mr. McCracken.

534. **X-rays.** Sources, absorption, scattering, reflection by crystals, continuous and line spectra, quantum relations and energy levels, spectral series, X-ray spectrometry. Prerequisite: 323, or equivalent. Spring. Lect. and rec. 3. Credit 3. Mr. Pinney.

594, 595. **Electricity and Magnetism.** Electrostatics, magnetostatics, steady currents, networks, chemical and thermal effects, electromagnetism, electric and magnetic instruments, induction, dielectrics, magnetic materials, electromagnetic waves. Prerequisite: 323. Fall, Winter, respectively. Lect. and rec. 3. Credit 3 each course. Mr. Willson.

607. **Theory of Alternating Currents.** Analytical, graphical, and complex quantity methods for a.c. circuit problems. Series and branched circuits having resistance, inductance, and capacitance. Resonance potentials and other frequency effects. Prerequisite: 594. Alternate years. Offered Spring, 1938. Lect. and rec. 3. Credit 3. Mr. Spinney.

610. **Seminar.** Credit 1 each time elected. Mr. Fox.

611, 612, 613. **Applied Light and Radiation.** Polarized light and applications, spectroscopy, Balmer series, Zeeman effect, nature of light, mechanical equivalent of light, cosmic rays, black body laws, radiation, pyrometry. Prerequisite: 516. Alternate years. Offered Fall, Winter, Spring, 1937-38. Lect. and rec. 3. Credit 3 each course. Mr. Kunerth.

614, 615. **Kinetic Theory.** Ideal gases, Maxwell's velocity law, molecules with dimensions, transport problems, change of state, equation of Van der Waals, vaporization, solutions, dissociation, condensation. Prerequisite: 504, Chem. 625, or equivalent. Alternate years. Offered Winter, Spring, respectively, 1939. Lect. and rec. 3. Credit 3 each course. Mr. Atanasoff.

620. **Research.** Messrs. Woodrow, Fox, Spinney, Carr, Kunerth, Stiles, Atanasoff, McCracken, Richards.

624, 625. **Electron Theory.** Theory of conduction through gases; glow, arc, and spark discharges; ionization processes and impact phenomena; atomic and molecular energy levels. Prerequisite: 595 or equivalent. Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course. Mr. Fox.

637, 638. **Advanced Theory of Electric Oscillations and Electric Waves.** Prerequisite: 607. Alternate years. Offered Fall, Winter, respectively, 1938-'39. Lect. and rec. 2. Credit 2 each course. Mr. Richards.

640. **Advanced Technical Physics.** Recent developments in the various fields of modern physics, with special emphasis on their applications. Prerequisite: 504, 516, 595, or equivalent. Messrs. Woodrow, Fox, Carr, Kunerth, Stiles, Atanasoff, Richards.

650. **Photography in Scientific Work.** Methods of photography in specialized fields; choice of filters and plates; photomicrography; color photography. Prerequisite: 316 and permission of the instructor. Winter. Lab. 2, 3 hr. Credit 2 each time elected. Mr. Carr.

651, 652, 653. **Introduction to Mathematical Physics.** (Math. 651, 652, 653.) Basic mathematics used in theoretical physics. Fundamental topics of classical and modern physics using mathematical concepts and methods. Prerequisite: 504, 516, 595, Math 314, or equivalent. Fall, Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course. Mr. Atanasoff.

681, 682, 683. **Quantum Mechanics.** (Math. 681, 682, 683.) Newer developments in the quantum theory and their application to problems in physics and chemistry. Prerequisite: 653 or equivalent. Alternate years. Offered Fall, Winter, Spring, respectively, 1937-38. Lect. 3. Credit 3 each course. Mr. Atanasoff.

## PSYCHOLOGY

J. E. EVANS, Head of Department

Professors Gaskill, Vance; Associate Professors Fritz, Lauer  
Instructor Henry

*For information concerning the Division of Industrial Science, see page 131.*

Every vocation that involves the human element is of necessity founded on psychological principles. It is for this reason that the various courses offered by the department are formulated from the point of view of the practical needs of students in the industrial and vocational fields.

Psychology has the following aims: (1) To give fundamental infor-



mation concerning one's self; (2) To aid in a more accurate understanding of other people; (3) To present the essential psychological principles underlying effective teaching and to give a scientific appreciation of child behavior in its relation to parental problems; (4) To apply the principles of psychology to the human element in business and industry.

### Description of Courses

**Note.** Psychology 204, 334 or 634, and 434 are required toward the state teachers' certificate. See State Teachers' Certificate, page 337.

**105. How to Study.** Methods of mental efficiency. Principles underlying successful study, class room procedure, and examinations. A help class for those needing assistance. Fall and Winter for one-half term with two recitations and one period each week for conference. For freshmen and sophomores only. Rec. 2. Credit 1.

**204. General Psychology.** Study of normal human behavior. Fundamental to all other courses in Psychology. Fall, Winter, Spring. Rec. 3. Credit 3.

**206. Laboratory in General Psychology.** A laboratory course paralleling or following 204. Rec. 1. Lab. 1, 2 hr. Credit 2. Spring.

**320. Special Problems.** Prerequisite: 5 credits in psychology, including elementary psychology, and permission of the head of the department. Fall, Winter, Spring. Credit 1 or 2 each quarter. Limit 5 credits.

**334. Educational Psychology.** The various concepts of learning and improvement. Psychology of high school subjects. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3.

**335. Educational Psychology.** The treatment of the psychological factors involved in motivation and educational efficiency. Prerequisite: 334. Winter. Rec. 3. Credit 3.

**414. Psychology of the Family.** A study of the development of the affections, mutual relationships; analysis of personal likes and dislikes; emotional development and psychological maturity; a consideration of conservation of energy, and personal efficiency, analysis of family leisure. Prerequisite: 204, Ec. 385. Alternate years. Offered Spring, 1939. Rec. 3. Credit 3.

**415. Childhood and Adolescence.** Behavior of children with special reference to the pre-school age; critical changes of early adolescence. Development from the point of view of the parent. One hour each week of observation of children required. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3.

**420. Special Topics.** Prerequisite: 9 credits of psychology and permission of the head of the department.

**424. Social Psychology.** Psychology of people in consequence of their associations; the crowd mind, the mob and other crowds; public opinion and propaganda. Prerequisite: 6 credits of psychology including Psych. 204. Winter. Rec. 3. Credit 3.

**426. Psychology of Personality.** Principles underlying personality development, and personality measurement. Analysis of personality traits, development of interest. Personality in its relation to effective speaking and writing. Prerequisite: 204. Spring. Rec. 3. Credit 3.

**428. Psychology of Religion.** The facts of psychology which relate to religion. The contributions of psychology to a working faith. Prerequisite: 204. Alternate years. Offered Winter, 1938. Rec. 2. Credit 2. See also Religious Education, page 313.

**434. Tests and Educational Measurement.** Treatment of tests and their application in educational, vocational, and industrial guidance and selection. Important for teachers, employers, and vocational counselors. Prerequisite: 204. Fall, Spring. Rec. 3. Credit 3.

**454. Psychology and its Application.** A survey of the applications of psychology. Individual differences, character and temperament, disordered minds, crime, mental efficiency, integration of self, emotions, tests and test results, group minds, public opinion, leadership, success, psychology and the professions. Prerequisite: 204. Winter. Rec. 4. Credit 4.

**468. Laboratory Course in Industrial Psychology.** Laboratory investigation of fatigue, rest periods, optimum periods of work, habit formation, and motor coordination, industrial tests, etc. Prerequisite: 6 credits of psychology. Alternate years. Offered Fall, 1937. Laboratory 2. Rec. 1. Credit 2.

**474. Psychology of Safety.** Safety analyzed from the standpoint of the individual. Observation of techniques used in diagnosing accident-proneness. The relation of fatigue, health, attitudes, sensory defects, emotional instability and intelligence to accident causation. Educational methods for reducing accidents. Designed for educational directors, safety engineers, industrial workers, and others interested in public safety. Prerequisite: 6 credits of psychology. Alternate years. Offered Spring, 1939. Rec. 3. Credit 3.

**484. Psychology of Advertising.** Principles of psychology that relate to advertising. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3.

**485. Psychology of Salesmanship.** The principles of psychology that relate to selling. Prerequisite: 6 credits of psychology. Winter. Rec. 3. Credit 3.

**488. Psychological Influences Underlying Economic Problems.** Analysis of the fundamental motives and wants in economic problems. Prerequisite: 204, and 6 credits of Economics and History. Alternate years. Offered Fall, 1937. Rec. 3. Credit 3.

**516. Advanced Child Psychology.** Psychological technique necessary to handle the pre-school child. For those dealing with the young child either individually or in groups. Prerequisite: 415. Fall. Rec. 3. Credit 3. Mr. Vance.

**530. Psychology of Skill.** The development of skill and skill techniques. Habit making and breaking; transfer of training and its principles; mechanical aptitudes and intelligence. Principles of motivation effective in the shop; development of muscular co-ordination. Laboratory methods and demonstrations. Prerequisite: 204. Alternate years. Offered Winter, 1939. Rec. 3. Credit 3. Mr. Evans.

**533. Test and Measurement Interpretation.** Development of ability to interpret the measurement methods and quantitative principles used in educational, psychological and vocational literature. Prerequisite: 6 credits of psychology. Winter. Rec. 3. Credit 3. Mr. Fritz, Mr. Gaskill.

**538. Psychology of Guidance and Vocational Selection.** General analysis of work, principles of self-analysis for vocational guidance. Principles of guidance for teachers. Prerequisite: 204. Spring. Rec. 2. Credit 2. Mr. Evans, Mr. Gaskill.

**544. Abnormal Psychology in Relation to Industrial Problems.** The various types of abnormal mentality and mental disorders in their relation to industry; the significance and importance of mental hygiene and occupational therapy in modern life. Prerequisite: 6 credits of psychology. Spring. Rec. 3. Credit 3. Mr. Evans.

**564. Industrial Psychology.** The human element in industrial and vocational problems; classification and handling of men. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3. Mr. Evans.

**596. Seminar in Industrial Psychology.** Investigation of problems. Seniors and graduates only. Prerequisite: 9 credits of psychology, and permission of the head of the department. Fall, Winter, Spring. Credit 1 each time elected. Mr. Evans.

**620. Research.** Messrs. Evans, Vance, Fritz, Lauer, Gaskill.

**634. Educational Psychology.** The various concepts of learning and improvement. Psychology of high school subjects. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3. Graduates who have not had 334. Messrs. Lauer, Fritz.

**635. Educational Psychology.** The treatment of the psychological factors involved in motivation and educational efficiency. Prerequisite: 334 or 634. Winter. Rec. 3. Credit 3. Graduates who have not had 335. Mr. Fritz.

**636. Educational Psychology.** A critical view of the psychology of mass education as it concerns group action, crowd behavior, co-operation, social participation; psychology of modern leisure and culture. Prerequisite: 334 or 634. Alternate years. Offered Fall, 1938. Rec. 3. Credit 3. Mr. Evans, Mr. Vance.

## PUBLIC SPEAKING

GUY S. GREENE, Head of Department

Professor Shattuck; Assistant Professors Lenrow, Whan;  
Instructors North, Stone, Voss, Wilkinson

*For information concerning the Division of Industrial Science, see page 131.*

The instruction offered by this department is designed to give the student a knowledge of the principles underlying effective oral com-

munication and an opportunity for frequent practice in the application of those principles. To this end the department offers courses of two main types: those dealing with the composition and delivery of original speeches, and those dealing with the oral interpretation of literature. Courses of the first type are 311, 312, 313, 334, and 335; courses of the second type are 254, 255, 361, 362, 363, 474, and 475.

Graduates often find opportunities to direct the work of school and community dramatic organizations or debating teams. For students who wish to fit themselves for such work, the department suggests the following sequences: for dramatic production, 104, 254, 361, 474, 475; for debating, 104, 311, 312, 334, 335.

Students who wish to offer public speaking as a minor are required to complete a minimum of 15 credits of work in the department, including courses 104, 254, 311, and 312.

This department, with the co-operation of the Departments of Hygiene and Psychology and the Committee on English, maintains a speech clinic, the purpose of which is to deal with individual speech problems. The services of the clinic are available to all students.

### Description of Courses

104. **Voice and Speech.** Principles of voice production and enunciation; standards of pronunciation. Practice for improvement of habits of speech based upon needs of individual students. Fall, Winter, Spring. Rec. 2. Credit 2.

254, 255. **Oral Reading.** (254) Principles of oral interpretation of literature; practice in reading aloud. Fall, Winter, Spring. (255) Methods of interpretation of poetry; practice in critical analysis and oral interpretation of lyric and dramatic poems. Spring. Rec. 3. Credit 3 each course.

311, 312, 313. **Extempore Speaking.** Prerequisite: Engl. 103. (311) Fundamental principles of public speaking; frequent practice in composition and delivery of short extemporaneous speeches; emphasis upon methods of exposition. Fall, Winter, Spring. (312) Continuation of 311; emphasis upon methods of persuasion and problems of delivery. Fall, Winter, Spring. (313) Study of various types of speeches, including radio speeches; practice in composition and delivery of types suited to needs of individual students. Winter, Spring. Rec. 2 or 3. Credit 2 or 3 each course.

334, 335. **Argumentation and Debate.** Prerequisite: 311, or permission of instructor. (334) Study and application of principles of conviction; practice in composition and delivery of debate speeches. Fall, Winter, Spring. (335) Continuation of 334; study and application of principles of persuasion; practice in debating. Spring. Rec. 3. Credit 3 each course.

361, 362, 363. **Play Selection.** Study of plays with attention to principles of production. Practice in reading plays to develop appreciation and to aid in selection for amateur production. Prerequisite: permission of instructor. (361) Fall, Winter, Spring. (362) Winter. (363) Spring. Credit 3 each course.

474, 475. **Dramatic Production.** Prerequisite: 254 or 361, or permission of instructor. (474) Principles of play production, including casting, rehearsing, acting, staging, lighting, and make-up; practice in presenting plays. Fall, Winter, Spring. (475) Theory and practice of stagecraft; design and construction of scenery and technique of lighting. Spring. Credit 3 each course.

### RELIGIOUS EDUCATION

*For information concerning the Division of Industrial Science, see page 131.*

The work of this department is carried on as a means of helping students in correlating their religious thinking with points of view which naturally develop as they study the various sciences. The studies offered are open only to students regularly enrolled in the College.

## Description of Courses

324. **An Introduction to the Bible.** The message of the Bible in the light of its historical background and development. Fall, Spring. Rec. 3. Credit 3.

326. **The Growth of Christianity.** An appreciation of some of the leading persons and the significance of the principal events and trends in the development of Christianity. Winter. Rec. 3. Credit 3.

329. **The Religions of Mankind.** A study of the various religions of the world. Fall, Spring. Rec. 2. Credit 2.

434. **Social and Ethical Teachings of Jesus.** Present day Christianity—its relation to the teachings of Jesus and its bearing upon modern life. Winter, Spring. Rec. 2. Credit 2.

437. **The Meaning and Purpose of Life.** The guiding principles of human life. How discovered. How used as possibilities for promoting the greatest values. Fall, Winter. Rec. 2. Credit 2.

439. **Methods of Religious Work.** A study of typical programs of present day religious work together with practice in program building. Winter, Spring. Rec. 2. Credit 2.

## RURAL SOCIOLOGY

For work in Rural Sociology, see Agricultural Economics, page 165, and Economics, page 225.

## SOILS

(Sub-Department of Agronomy).

For description of courses, see page 180.

## TECHNICAL JOURNALISM

BLAIR CONVERSE, Head of Department

Assistant Professors Beckman, Marvin; Instructors, Fox, Goeppinger;  
Graduate Assistants Helt, Zoller

*For information concerning the Division of Agriculture, see page 120.*

Instruction in technical journalism is offered to all students and adapted as far as possible to their various needs. Its purpose is two-fold: to serve those professionally interested in technical journalism and to aid those wishing less extensive work.

To "professional" students it offers training for editorial positions with the technical, business and trade press, for advertising positions with such publications and with industries, and for rural community journalism. To these ends it offers:

1. A four-year curriculum in Agricultural Journalism.
2. A major sequence in journalism for students of Home Economics.\*
3. A sequence of journalism subjects which may be elected by students of Engineering.\*\*

\*For journalism sequence for Home Economics students, see page 274.

\*\*Engineering students who desire to elect a sequence in Technical Journalism may substitute journalism courses for required engineering courses upon the consent of the head of their department and their dean.

4. Groups of journalism subjects which may be elected by students of Industrial Science.

Students who desire to take a smaller amount of work, but enough to give them facility in writing for the press and in dealing with advertising problems, may elect suitable studies.

The department maintains a periodical reading room, a writing laboratory and a type laboratory. Excellent opportunity for practical experience is offered through work on such publications as the Iowa Agriculturist, the Iowa Engineer, the Iowa Homemaker, and Iowa State Student (three-times a week newspaper), and other publications issued at the College. The Collegiate Press, Inc., established to print these newspapers and magazines, gives opportunity to students to get contact and experience with the printing side of journalism.

Instruction in Agricultural Journalism was instituted in 1905 through the generosity of the late Mr. John Clay of Chicago. It was the first work of its kind. The John Clay agricultural journalism gifts have been accumulated in a scholarship fund, the income from which makes possible the offering of the John Clay graduate assistantship.

Many former students are in positions of prominence in the farm journalism and other technical fields.

Curriculum In Agricultural Journalism

Leading to the degree of Bachelor of Science.

Students are required to spend the summer following their Sophomore year in practical farm work on an approved farm and to spend the summer following their Junior year in practical work with some approved farm journal or other paper.

There shall be a total of 15 hours of electives taken in one major line of agriculture. Thirty hours in all must be elected in courses in agriculture or related to agriculture.

FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101 <sup>1</sup>	4	Chem. 102	4	Chem. 103	4
Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101	2	A.H. 102	2	A.H. 103	2
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
Crop Production		Crop Production		General Horticulture	
F.C. 104	4	F.C. 105	4	Hort. 114	3
General Botany		Electives	3	Mathematics	
Bot. 101	3			Math. 205	4
Military 121	1	Military 122	1	Military 123	1
	<hr/> 17		<hr/> 17		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., T.Jl. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 177.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Technical Writing		Technical Writing		Technical Writing	
T.Jl. 221	4	T.Jl. 222	4	T.Jl. 223	4
Organic and Quantitative		*Organic and Quantitative		Forage Crops	
Chem. 255	3	Chem. 256	3	F.C. 214	4
Gen. Poul. Husbandry	3	Reasoning and Writing		Farm Dairying	
A.H. 144 or	3	Engl. 205	3	D.I. 114	4
Breeds of Livestock	4	Gen. Agr. Economics		Gen. Agr. Economics	
A.H. 205	4	Ec. 232	3	Ec. 233	3
Gen. Agr. Economics		General Psychology		Electives	1
Ec. 231	3	Psych. 204	3		
Soils					
Soils 254	3				
Military 221	1	Military 222	1	Military 223	1
	17 or 18		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Seminar, T.Jl. 201, 202, 203.

\*Students who do not plan to take their minor work in animal husbandry or farm crops and soils may substitute, with the consent of the Department of Technical Journalism, another course for Chemistry 256.

## JUNIOR YEAR

Technical Writing		Technical Writing		Technical Writing	
T.Jl. 321	3	T.Jl. 322	3	T.Jl. 323	3
Copy Editing and		Copy Editing and		Copy Editing and	
Typography		Typography		Typography	
T.Jl. 341	2	T.Jl. 342	2	T.Jl. 343	2
Business Psychology		Technical Advertising		Management of Technical	
Psych. 484	3	T.Jl. 445	3	Journals	
General Bacteriology		American Government		T.Jl. 451	2
Bact. 804A	5	Govt. 815	3	Technical Advertising	
Farm Machinery		Economic History		T.Jl. 446	3
A.E. 834	4	Hist. 324	3	American Nation	
		Electives	3	Hist. 423	3
				Electives	4
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, T.Jl. 301, 302, 303.

For information concerning the Reserve Officers' Training Corps, see page 301.

## SENIOR YEAR

Management of Technical		Management of Technical		Technical Writing	
Journals		Journals		T.Jl. 423	3
T.Jl. 452	2	T.Jl. 453	2		
Mechanics of Printing		Technical Writing		Electives	14
and Illustrating		T.Jl. 422	3		
T.Jl. 465	3	Principles of Sociology			
Technical Writing		Ec. 384	3		
T.Jl. 421	3	Electives	9		
Money and Banking					
Ec. 304	3				
Electives	6				
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, T.Jl. 401, 402, 403.

## Description of Courses

For description of non-collegiate courses, see page 348.

110. Technical Lecture. Survey of the field of agricultural and technical journalism. Spring. Lect. 1. Required.

201, 202, 203. Seminar. Survey of the field of agricultural and technical journalism. Required each course.

221, 222, 223. Technical Writing. News values, news style, news gathering and writing, history of technical journals. Prerequisite: Engl. 103. Fall, Winter, Spring, respectively. Lab. 4, 3 hr. Credit 1 to 6 each course. Students enroll for 4 labs. Quality of work determines the number of credits earned. Open to professional journalism students.

225, 225A, 225B. Beginning Technical Journalism. News values, news gathering and writing, with special reference to technical subject matter. Prerequisite: Engl. 103. Fall, Winter, Spring. (225) Rec. 3. Credit 3. (225A) For engineering students. Rec. 2 or 3. Credit 2 or 3. (225B) For home economics students. Rec. 3. Credit 3.

301, 302, 303. Seminar. Continuation of 203. Required each course.

321, 322, 323. Technical Writing. Gathering of material and preparation of articles for technical magazines, editorial writing. Prerequisite: 223. Fall, Winter, Spring, respectively. Rec. and confer. 3. Practice work as arranged. Credit 1 to 5 each course. Students enroll for 3 hours. Quality of work determines number of credits earned. Open to professional journalism students.

325. Technical Advertising. Same as 445. For other students than those professionally interested in advertising. Fall, Winter, Spring. Rec. 2. Confer. 1. Credit 2 or 3.

335. Feature Articles for Technical Journals. Writing of the longer feature and magazine articles dealing with agriculture, engineering, or home economics. Prerequisite: 225. Fall, Winter, Spring. Rec. 3. Credit 3.

341, 342, 343. Practice in Copy Editing and Typography. Copy editing, headline writing and make-up. Type, type setting and design of printed matter. Prerequisite: 223 or 225. Fall, Winter, Spring, respectively. Lab. 2, 3 hr. Credit 2 each course.

401, 402, 403. Seminar. Continuation of 303. Required each course.

421, 422, 423. Technical Writing. Practice with various types of news writing, problems and readings in journalism ethics, law and the psychology of public opinion. Prerequisite: 323. Fall, Winter, Spring, respectively. Rec. and confer. 3. Practice work as arranged. Credit 1 to 5 each course. Students enroll for 3 hours. Quality of work determines number of credits earned. Open to professional journalism students.

445, 446. Technical Advertising. Fundamental principles and practice of advertising. Application to industries related to agriculture, engineering, home economics and the sciences. (445) Winter. Rec. 3. Credit 3. (446) Spring. Rec. 1. Lab. 2, 3 hr. Credit 3. Both courses open to professional journalism students.

451, 452, 453. Management of Technical Journals. Editorial, advertising, and circulation problems. Legal and ethical phases of technical journalism. Prerequisite: 223 or 225. Spring, Fall, Winter, respectively. Rec. 2. Credit 2 each course.

465. Mechanics of Printing and Illustrating. Study of mechanical phases of making of a newspaper or technical journal. Prerequisite: 223 or 335. Alternate years. Offered Fall, 1938. Rec. 3. Credit 3.

475. Radio Writing. Preparation of material for radio broadcasting. Prerequisite: 335 or 323, and P.S. 254 or equivalent. Fall, Winter, Spring. Rec. 3. Credit 3.

## THEORETICAL AND APPLIED MECHANICS

HERBERT J. GILKEY, Head of Department

Associate Professor Dunagan; Assistant Professors Jensen\*, Lightburn, Murphy; Instructors Chamberlin, Higdon, Johnson, McDowell, Stiles; Graduate Assistant Beal •

*For information concerning the Division of Engineering, see page 125.*

The courses in mechanics are intermediate between those in physics and mathematics and the professional and design courses of the several engineering curricula. In the work of this department the student is

\*Absent on leave.

expected to acquire an elementary conception of the principles underlying the technique of analysis and a knowledge of those properties of materials which influence the manner and extent of their use for engineering purposes. He is expected to gain some insight into the background of purchase and design specifications. Physical properties of engineering materials are studied in the classroom and are determined in the laboratory. General laws, such as those of Newton, are given mathematical expression and are made suitable for use in the solution of specific problems in machine and structural design and in the flow and measurements of liquids. Rigorous training is supplied in the simpler applications of the laws of mechanics.

### Description of Courses

**274. Statics of Engineering.** Force systems, resultants, equilibrium, friction, centroids, moments of inertia. Prerequisite: Math. 212. Fall, Winter, Spring. Rec. 3. Credit 3.

**324. Mechanics of Materials.** Elements of stress analysis as applied to boilers, beams, shafts, springs, columns, etc. Includes simple stress, combined stresses, deflections, eccentric loading, impact, and fatigue. Prerequisite: 274. Fall, Winter, Spring. Rec. 5. Credit 5.

**327. Materials Laboratory.** Experimental determination of physical properties of steel, cast-iron, timber, concrete and/or other engineering materials. Studies of specifications. Preparation of reports. Prerequisite: credit or classification in 324. Fall. Lab. 1, 3 hr. Credit 1. Winter, Spring. Lab. 1 or 2, 3 hr. Credit 1 or 2.

**334. Properties of Materials.** Properties, uses, and manufacture of metals, timber, stone, clay products, cements, concrete, and other engineering materials. Fall, Winter, Spring. Rec. 2. Credit 2.

**338. Cement and Concrete.** Design and control of concrete mixtures. Testing of cement, aggregates, and plain concrete. Factors influencing the strength and usefulness of concrete. One one-day inspection trip. Prerequisite: 327, 334. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

**344. Dynamics of Engineering.** Moments of inertia of masses; kinematics; motions of particles and of rigid bodies. Kinetics; force, mass, acceleration; work and energy; impulse and momentum. Prerequisite: 274. Fall, Winter, Spring. Rec. 4. Credit 4.

**378. Hydraulics.** Mechanics of liquids. Static pressure on tanks, dams, and pipes. Flow through orifices, nozzles, pipe lines, canals, weirs, etc. Measurement of water. Elementary hydro-dynamics. Prerequisite: 344. Fall, Winter, Spring. Rec. 2. Group conferences 2, 2 hr. Credit 4.

**498. Construction Materials.** Field inspection. Sampling, testing methods; advanced studies relating to the structural use of such materials as timber, concrete, clay products, and metals. Prerequisite: 324, 327, 334 (also 338 when the work is to be largely with concrete). Fall. Rec. 1. Lab. 2, 3 hr. Credit 3 to 6.

**514. Advanced Mechanics of Materials.** Special problems met in engineering. Limitations of flexure and torsion formulas, unsymmetrical bending, curved beams, combined stresses, thin tubes, thick hollow cylinders, flat plates. Prerequisite: 324. Rec. 3. Credit 3. Messrs. Gilkey, Jensen, Murphy.

**515. Development of Mechanics.** Historical study of the development of the principles of mechanics. Rec. 3. Credit 3. Mr. Gilkey, Mr. Murphy.

**516. Advanced Properties of Engineering Materials.** Properties in relation to use; factors that influence working stresses; basis of standard specifications. Prerequisite: 324, 334. Rec. 3. Credit 3. Mr. Gilkey.

**524. Advanced Technical Statics.** Principle of virtual work; moment distribution; the column analogy; applications to engineering problems. Prerequisite: 324. Rec. 3. Credit 3. Mr. Jensen.

**594, 595. Applied Elasticity.** The fundamental relations of elasticity; uniform and non-uniform states of stress; Airy's function; applications to engineering problems. Prerequisite: 324. Rec. 3. Credit 3 each course. Mr. Jensen.

**600. Research.** Messrs. Gilkey, Griffith, Dunagan, Holl, Jensen, Murphy.



606. **Higher Mechanics of Engineering.** Application of the general dynamic equations to the analyses of such structures as retaining walls, tunnels, beams, and columns; general laws of distribution; structure of matter. Prerequisite: 324. Rec. 1. Lect. 1. Lab. 1, 3 hr. Credit 3. Mr. Griffith.

614. **Analytical Study of Experimental Work in Concrete.** An interpretative survey of the background of present concrete practice. Prerequisite: 338, C.E. 437, or equivalent. Rec. 3. Credit 3. Mr. Gilkey.

661, 662, 663. **Mathematics of Elasticity.** (Math. 661, 662, 663.) Two dimensional elastic problems; general stress strain analysis in three dimensions; stability and vibration of beams and columns. Prerequisite: Math. 314. Alternate years. Offered Fall, Winter, Spring, respectively, 1937-38. Lect. 3. Credit 3 each course. Mr. Holl.

666, 667, 668. **Static and Dynamic Problems of Plates and Shells.** (Math. 666, 667, 668.) Thin plate analysis; three dimensional plate problems; shells, stability and vibration of plates and shells. Prerequisite: Math. 314 and permission of instructor. Alternate years. Offered Fall, Winter, Spring, respectively, 1938-39. Lect. 3. Credit 3 each course. Mr. Holl.

## VEGETABLE CROPS

See Horticulture, page 275.

## VETERINARY MEDICINE

For general statement concerning the Division of Veterinary Medicine, see page 134.

## ENTRANCE REQUIREMENTS

See also Entrance Requirements by Divisions, page 99.

Applicants for admission to the Division of Veterinary Medicine must present a total of not less than 1 year (45 quarter or 30 semester credits) of work in an approved college or university. The college credits must include:

1. English----- 9 quarter credits ( 6 semester credits)
2. Chemistry-----12 quarter credits ( 8 semester credits)
3. Biological Sciences----- 9 quarter credits ( 6 semester credits)
4. Electives-----15 quarter credits (10 semester credits)

It is recommended that the biological sciences be 6 credits in zoology, 3 credits in botany, and that the electives be selected from German, French, mathematics, and physics.

For those who wish to take their pre-veterinary work at Iowa State College, the Division of Industrial Science offers excellent facilities. Deficiencies in entrance credits can be made up here not only during the college year but also during the summer sessions. See also Restricted Enrollment, below.

Curriculum for Pre-Veterinary students, see page 287.

## RESTRICTED ENROLLMENT

The demand for veterinarians has resulted in larger enrollment in all of the veterinary colleges. Recently, Iowa State College has been receiving applications for admission to the curriculum in Veterinary Medicine from more students than can be effectively trained with the present

staff and equipment. For this reason, it has become necessary to limit the enrollment in the first-year class in Veterinary Medicine to approximately sixty students.

In selecting the candidates for the first-year class, a personal conference with some member of the veterinary faculty or other person designated by the College will be required in each case. High school records, scholastic performance in the pre-veterinary year, experience, and evidence of good character and satisfactory personality will be given special consideration in selecting students for this curriculum. Other things being equal, residents of Iowa will be given preference.

### GENERAL PLAN OF INSTRUCTION

The fundamental veterinary sciences are studied during the first two years and in all subjects the work is concentrated with an increased efficiency in methods of instruction. Much of the instruction is given as laboratory exercises and forms the foundation for the practical work which follows.

The third and fourth years are devoted to the practical clinical courses which are taught by lectures, quizzes and use of clinical cases.

### Curriculum In Veterinary Medicine

Leading to the Degree of Doctor of Veterinary Medicine.

For entrance requirements, see page 319.

#### FIRST YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Gross Anatomy		Gross Anatomy		Gross Anatomy	
Vet.Anat. 211	6	Vet.Anat. 212	7	Vet.Anat. 218	7
Microscopic Anatomy		Microscopic Anatomy		Microscopic Anatomy	
Vet.Anat. 201	5	Vet.Anat. 202	4	Vet.Anat. 208	4
Organic Chemistry		Physiological Chemistry		Animal Husbandry	
Chem. 174	5	Chem. 175	5	A.H. 107	6
Military 221	1	Military 222	1	Military 228	1
Physical Education 201	R	Physical Education 202	R	Physical Education 208	R
	<u>17</u>		<u>17</u>		<u>18</u>

#### SECOND YEAR

Bacteriology		General Pathology		Special Pathology	
Vet.Hyg. 224	7	Vet.Path. 255	7	Vet.Path. 256	7
Mammalian Physiology		Nutritional Physiology		Mammalian Physiology	
Vet.Phys. 264	6	Vet.Phys. 265	6	Vet.Phys. 266	6
General Pharmacology		Pathogenic Bacteriology		Special Pharmacology	
Vet.Phys. 267	4	Vet.Hyg. 225	5	Vet.Phys. 268	5
	<u>17</u>		<u>18</u>		<u>18</u>

## THIRD YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Medicine		Medicine		Medicine	
Vet.Med. 381	5	Vet.Med. 382	6	Vet.Med. 383	5
General Surgery		Special Surgery		Special Surgery	
Vet.Surg. 371	6	Vet.Surg. 372	5	Vet.Surg. 373	7
Animal Parasites		Obstetrics		Small Animal Medicine	
Vet.Path. 354	5	Vet.Obst. 345	5	Vet.Med. 386	3
Clinics		Clinics		Clinics	
Vet.Surg. 381	1	Vet.Surg. 382	1	Vet.Surg. 383	1
Clinics		Clinics		Clinics	
Vet.Med. 381	1	Vet.Med. 382	1	Vet.Med. 383	1
	<hr/> 18		<hr/> 18		<hr/> 17

## FOURTH YEAR

Infectious Diseases		Infectious Diseases		Meat Hygiene	
Vet.Hyg. 421	5	Vet.Hyg. 422	5	Vet.Hyg. 423	3
Clinics		Clinics		Clinics	
Vet.Surg. 481	2	Vet.Surg. 482	2	Vet.Surg. 483	2
Clinics		Clinics		Clinics	
Vet.Med. 481	2	Vet.Med. 482	2	Vet.Med. 483	2
Ophthalmology		Advanced Therapeutics		Advanced Therapeutics	
Vet.Surg. 490	2	Vet.Phys. 465	2	Vet.Phys. 466	2
Business Law		Poisonous Plants		Applied Avian Pathology	
Ec. 365	3	Bot. 456	3	Vet.Path. 450	3
*Electives	3	Dairy Hygiene		Feeds and Feeding	
		Vet.Hyg. 420	3	A.H. 416	3
				Serum & Vaccine Therapy	
				Vet.Hyg. 429	3
	<hr/> 17		<hr/> 17		<hr/> 18

\*Electives to be chosen in consultation with the classifying officer. Suggested courses to be used as electives include: Veterinary Obstetrics 444, 445, 446; Veterinary Surgery 477; Genetics 800; Government 315.

## VETERINARY ANATOMY

H. L. Foust, Head of Department

Assistant Professor Leith; Instructors Cocking, Wood;  
Assistant Calhoun

*For information concerning the Division of Veterinary Medicine, see page 134.*

The department of Anatomy gives instruction to students in both Veterinary Medicine and Animal Husbandry. The laboratories are well equipped. In histology each student is assigned an individual desk with a microscope, and 200 permanent mounts of tissue. The dissecting room is modern. All cadavers are preserved. Students in Animal Husbandry prepare for their work in nutrition and stock judging. Veterinary students should have a detailed knowledge of the anatomy of the domestic animals to properly understand Physiology, Pathology, Diagnosis, Surgery, and Medicine.

The following methods are used in teaching anatomy; didactic instruction, quiz, specimen demonstration, specimen study, lantern slide demonstration, dissection, sketching, the use of the living animal for palpating and outlining the structures. A large and well selected number of specimens and lantern slides are used in the class and laboratory demonstrations to emphasize the most important structures and their

relations from a clinical standpoint. In the laboratory special attention is given to fascial compartments, joint pouchings, vaginal sheaths, bursae, and topography.

The class work is mostly quizzes, with supplemental statements and demonstrations by the instructors to fix the knowledge of the structures of the animal body gained in the laboratory by the student.

### Description of Courses

201, 202, 203. **Microscopic Anatomy and Histology.** Cells, tissues and organs, histogenesis, embryogeny, organogenesis, and structure. (201) Fall. Lect. 2. Lab. 3, 3 hr. Credit 5. (202) Prerequisite: 201. (203) Prerequisite: 202. Winter, Spring, respectively. Lect. 1. Lab. 3, 3 hr. Credit 4 each course.

211, 212, 213. **Gross Anatomy.** Systematic and topographic study and dissection of horse, ox, sheep, pig, dog, fox, cat, chicken, and laboratory animals. (211) Fall. Rec. 2. Lab. 4, 3 hr. Credit 6. (212) Prerequisite: 211. Winter. Rec. 2. Lab. 5, 3 hr. Credit 7. (213) Prerequisite: 212. Spring. Rec. 3. Lab. 4, 3 hr. Credit 7.

217. **Anatomy of Domestic Animals.** For Animal Husbandry students. Skeleton, muscles, and visceral organs of the horse and ox, including the common unsoundnesses of the horse. Fall, Winter. Rec. 3. Credit 3.

#### 616. Research.

A. Gross Anatomy. Mr. Foust.

B. Microscopic Anatomy. Mr. Foust.

## VETERINARY HYGIENE

CHARLES MURRAY, Head of Department

Associate Professor Merchant; Instructor Karlson; Graduate Assistant Venzke

*For information concerning the Division of Veterinary Medicine, see page 134.*

Veterinary Hygiene includes the study of the causes of disease, the methods of controlling them, and the regulation of the habitation of animals.

The diseases of animals which are caused by bacteria and filtrable viruses are usually epidemic in character and must be handled as herd problems. Prevention and control are often attained by the use of immunizing agents; consequently the manufacture and use of bacterins, vaccines and antisera are of importance. The eradication of diseases by the removal of infected animals necessitates the use of proven diagnostic tests. The teaching of these tests and instruction in methods followed in federal eradication programs are important functions of veterinary hygiene.

The prevention of animal diseases which are transmitted by direct contact or by animal products to man is an important function of public health. The veterinary graduate is often employed by municipal, state, and federal agencies to assist in the sanitary control of food resources, especially meat and milk. The technique of milk and meat inspection is given a prominent place in courses offered in the department.

## Description of Courses

224. **General and Pathogenic Bacteriology.** (Bact. 224.) Morphology, classification, cultivation and physiological characteristics of pathogenic bacteria; principles of infection and immunity. Fall. Rec. 4. Lab. 3, 3 hr. Credit 7.

225. **Pathogenic Bacteriology.** (Bact. 225) Detailed study of the bacteria associated with animal diseases. Continuation of 224. Winter. Rec. 3. Lab. 3, 2 hr. Credit 5.

420. **Dairy Hygiene.** Designed to acquaint the student with all the problems of sanitation encountered in milk production. Based upon the practical control of the Ames milk supply. Prerequisite: 3 years of Vet. Med. Fall, Winter, Spring. Rec. 2. Lab. 2, 2 hr. Credit 3.

421, 422. **Infectious Diseases.** Diagnosis and methods of control. General hygiene and sanitation. Fall, Winter, respectively. Rec. 5. Credit 5 each course.

423. **Meat Hygiene.** Conditions under which animals are slaughtered for human consumption; the diseases encountered with the disposition of such meat; designed to meet federal and municipal laws. Prerequisite: three years of Vet. Med. Spring. Lect. 3. Credit 3.

427. **Livestock Sanitation.** (For Agricultural students.) Prerequisite: Bact. 304. Spring. Lect. 3. Credit 3.

428. **Poultry Sanitation.** (For Poultry Husbandry students.) Alternate years. Offered Spring, 1939. Lect. 2. Credit 2.

429. **Serum and Vaccine Therapy.** Study of the manufacture of immune serums, vaccines, and bacterins. Indications for use and results obtained. Prerequisite: 224, 225, or equivalent. Spring. Rec. 3. Credit 3.

524. **Seminar.** Fall, Winter, Spring. Credit 1 each time elected. Mr. Merchant.

690. **Research.**

A. General and Food Hygiene. Mr. Merchant.

B. Pathogenic Bacteriology. (Bact. 690B) Mr. Murray.

## VETERINARY MEDICINE

C. H. COVAULT, Head of Department

Assistant Professor Smith

*For information concerning the Division of Veterinary Medicine, see page 134.*

The study of medicine summarizes and shows the application in practice of the training previously received in Anatomy, Physiology, Pathology, Bacteriology, and Therapeutics. The work is given in the form of lectures, quizzes and clinical demonstrations and extends throughout the Junior and Senior years. Diagnostic methods employed in the detection of animal diseases are carried out by each student on the various organs and systems of the different species of animals. The surrounding community furnishes an abundance of material for such work. When cases cannot be brought to the hospital, students are taken to the farms and given actual practice in the diagnosis and treatment of the cases under supervision of an experienced member of the faculty. The latter arrangement provides a large variety of cases and gives opportunity to observe both healthy and diseased animals under natural farm conditions, and the student is taught how to overcome difficulties frequently met with on the farms where facilities are restricted.

On completion of the Senior year the student has not only the theoretical knowledge, but some of the most practical methods of applying such knowledge. The transition from the student to the practitioner presents little difficulty after such training.

### Description of Courses

331, 332, 333. **Medicine.** Methods employed in the diagnosis of animal diseases and a consideration of diseases not widely spread. Prerequisite: Vet. Anat. 213; Vet. Hyg. 224; Vet. Path. 256; Vet. Phys. 266, 268. Fall, Winter, Spring, respectively. (331) Rec. 4. Lab. 1, 3 hr. Credit 5. (332) Rec. 5. Lab. 1, 3 hr. Credit 6. (333) Rec. 4. Lab. 1, 3 hr. Credit 5.

336. **Small Animal Medicine.** Treatment and prevention of diseases of small domestic animals. Prerequisite: Vet. Anat. 213; Vet. Hyg. 224; Vet. Path. 256; Vet. Phys. 266, 268. Spring. Rec. 3. Credit 3.

381, 382, 383. **Clinics.** From nine to eleven a.m. each day of the week except Sunday. Credit 1 each course.

481, 482, 483. **Clinics.** From nine a.m. to twelve m. each day of the week except Sunday. Credit 2 each course.

## VETERINARY OBSTETRICS

F. E. WALSH, Head of Department

Assistant Professor Anderson

*For information concerning the Division of Veterinary Medicine, see page 134.*

The significance of a thorough knowledge of the structure, function and disease of the reproductive organs is becoming increasingly apparent. The most important problem in many of our herds is the question of production, both in offspring and food products. The department of obstetrics presents not only the work in obstetrics but considers the entire reproductive life of our domestic animals and the diseases associated therewith; it also provides many opportunities for observation and treatment of such cases through the ambulatory clinic. While this clinic is not restricted to obstetrical cases, their emergency nature makes it necessary in most cases to treat them at the farm. The ambulatory clinic is therefore unusually adapted to the teaching of obstetrics and diseases of the genital organs. Numerous charts and specimens have been prepared to assist in the instrumental work. The lectures and recitations are given in the winter quarter of the Junior year, but the clinical work continues throughout the year.

### Description of Courses

345. **Principles and Practice of Obstetrics.** Care of pregnant animals. Causes and treatment of sterility. Winter. Prerequisite: First two years of Veterinary Curriculum. Lect. 5. Credit 5.

444, 445, 446. **Advanced Obstetrics.** Elective in senior year. Designed for those who are interested in more detailed problems in breeding disturbances as they arise in the domesticated animal. Number of students limited to 3 or 4 in a section. Fall, Winter, Spring, respectively. Credit 3 each course.

## VETERINARY PATHOLOGY

E. A. BENBROOK, Head of Department

Associate Professor Runnells; Assistant Professor Waller; Assistants Chaddock, Sloss

*For information concerning the Division of Veterinary Medicine, see page 134.*

The department of Veterinary Pathology occupies the northeast building of the veterinary quadrangle. A large general student laboratory facing north, east, and west is supplied with individual equipment for a section of thirty-two students. A bacteriology preparation room and a room-incubator open into the main laboratory. A class lecture room to accommodate sixty students is equipped with projection apparatus. Office and laboratory facilities are provided for the staff and for graduate students.

In the basement, four rooms are equipped for the diagnostic laboratory. Thousands of specimens are received here yearly from veterinarians and livestock owners of Iowa for the diagnosis of animal diseases. This material is also available for research and instructional purposes. The basement also contains a well-equipped preparation room for pathology and parasitology, including photomicrography, a hygiene laboratory, and an extensive pathology and parasitology specimen collection.

The work of the department consists of a systematic study of the causes of disease and the manner in which these causes bring about alterations in the anatomical structure and chemical and physiological activities of animal tissues. The application of this study makes diagnosis more accurate and forms the foundation for rational therapeutics.

## Description of Courses

255. **General Pathology.** Causes and effects of diseases applied to the body as a whole. Prerequisite: Vet. Hyg. 224; Vet. Anat. 203, 213; Vet. Phys. 264. Winter. Lect. and rec. 4. Lab. 3, 2 hr. Credit 7.

256. **Special Pathology.** Etiology, pathogenesis, lesions and termination of disease in organs or systems of organs; specific infectious diseases and post mortem technic. Prerequisite: 255. Spring. Lect. and rec. 5. Lab. 3, 2 hr. Credit 7.

354. **Veterinary Parasitology.** Parasites and parasitic diseases of domestic animals. Prerequisite: 255. Fall. Lect. and rec. 4. Lab. 1, 3 hr. Credit 5.

450. **Applied Avian Pathology.** The problems of disease and host resistance as encountered in poultry. Course taught by staff members of Veterinary Pathology and Veterinary Hygiene. Prerequisite: 256, 354; Vet. Hyg. 224, 226. Spring. Credit 3.

650. **Research.** Mr. Benbrook, Mr. Runnells.

655. **Seminar.** Meetings of the staff and graduate students to discuss pertinent literature and problems under investigation. Fall, Winter, Spring. Credit 1. Mr. Benbrook Mr. Murray.

Autopsies and clinical laboratory examinations are conducted for the Departments of Medicine, Surgery, and Obstetrics and are supplementary to Vet. Path. 255, 256 and 354.

## VETERINARY PHYSIOLOGY AND PHARMACOLOGY

H. D. BERGMAN, Head of Department

Associate Professor Hewitt; Assistants Irwin, Jones

*For information concerning the Division of Veterinary Medicine, see page 134.*

The southeast building of the Veterinary group is devoted to work in Physiology and Pharmacology. This building was planned for the investigation and teaching of physiological and pharmacological subjects, and is admirably arranged and equipped for the pursuance of general and research work.

In the general laboratories, students are provided with individual equipment as far as possible, and thus self reliance and individual responsibility are developed. The laboratories are well equipped with modern apparatus for physiological and pharmacological teaching and research.

Before attempting a proper conception of disease it is necessary to have an understanding of the normal functions of the body structures. The purpose of the work in Physiology is to make a detailed study of the normal functions and activities of the cells, tissues, organs, and systems constituting the animal body. The work is conducted by lectures, recitations, demonstrations, and laboratory work in which the chemical and physical processes of the animal body are considered in logical order. The lecture work is supplemented by the use of dissected specimens, demonstrations, and drawings. The laboratory work is devoted to the study of the respiratory, circulatory, muscular, and nervous systems; also digestion and absorption, and the circulating fluids of the body.

The subjects of Pharmacology are presented as lectures, assignments, laboratory and demonstration work.

### Description of Courses

**264. Mammalian Physiology.** Blood, lymph; organs of circulation; mechanism of respiration, respiratory processes and exchanges. Prerequisite: Vet. Anat. 203. Fall. Lect. and rec. 4. Lab. 2, 3 hr. Credit 6.

**265. Nutritional Physiology** Digestion, absorption and general metabolism; the organs of excretion; animal heat; general principles of nutrition; and animal feeding. Prerequisite: 264, Chem. 175. Winter. Lect. and rec. 4. Lab. 2, 3 hr. Credit 6.

**266. Mammalian Physiology.** Endocrine organs and internal secretions; muscular and nervous systems; special senses; reproduction and lactation. Prerequisite: 264, 265. Spring. Lect. and rec. 4. Lab. 2, 3 hr. Credit 6.

**267. Pharmacology.** Pharmaceutical processes and principles; metrology, prescription writing; classification and general properties of drugs; therapeutic methods. Prerequisite: Credit or classification in 264. Fall. Lect. and rec. 3. Lab. 1, 3 hr. Credit 4.

**268. Pharmacology and Therapeutics.** Detailed study of drugs important in veterinary medical practice, including physiological actions, therapeutic indications and posology. Prerequisite: 264, 265, 266, 267. Spring. Lect. and rec. 5. Credit 5.

**364. Comparative Physiology.** For Agricultural students. Physiology of the domestic animals, including the blood, lymph, circulatory and respiratory systems, organs of digestion and absorption as related to animal production. Prerequisite: Vet. Anat. 217. Fall. Lect. and rec. 3. Credit 3.



365. **Comparative Physiology.** Elective for Agricultural students. Continuation of 364 including general metabolism, ductless glands and internal secretions, kidneys and skin, animal heat, reproduction, and milk secretion. Spring. Lect. 3. Credit 3.

465, 466. **Advanced Therapeutics.** Clinical therapeutics covering the more recent developments in therapeutic practice and techniques. Prerequisite: Senior classification in veterinary medicine. Winter, Spring, respectively. Lect. 2. Credit 2 each course.

661, 662, 663. **Comparative Mammalian Physiology.** A series of courses especially adapted for graduate students as minor work for the M.S. and Ph.D. degrees in the fields of animal, dairy, or poultry husbandry; in the biological sciences, chemistry, and home economics.

The courses are conducted by lecture, laboratory work, and mammalian demonstrations covering the physiology of the body fluids and the organs of circulation; respiration and respiratory exchange; the alimentary tract and related organs, gastro-intestinal motility, digestion, absorption, and general nutrition; heat production and regulation; excretory organs and body excretions; the endocrine system; muscular and nervous system; reproduction and milk secretion. Fall, Winter, Spring, respectively. Credit 3 or 5 or more each course. Mr. Bergman, Mr. Hewitt.

665. **Research.** Mr. Bergman, Mr. Hewitt.

## VETERINARY SURGERY

G. R. FOWLER, Head of Department

Assistant Professor Johnson

*For information concerning the Division of Veterinary Medicine, see page 134.*

The Department of Surgery is especially well equipped for teaching the surgical diseases and surgery of the domestic animals. The equipment includes preserved museum specimens, charts, photographs, lantern slides, and modern surgical instruments, both for classroom and laboratory instruction.

The large variety of clinical material available throughout the year makes it possible to supplement the classroom discussion with daily laboratory demonstrations. In the surgical clinic, patients are suitably anaesthetized either by local or general anaesthesia for practically all operations, thus emphasizing the importance of humane methods of treatment and giving students much practical experience in the use of these agents.

Each patient upon entering the hospital is assigned to a senior student. The student examines the case and makes a report of his findings and conclusions to the professor who also examines the animal and discusses the case with the students. The senior student assists the professor in charge and is responsible for keeping an accurate record of the treatment, daily progress of the case, and the amount and cost of materials used. Each senior student has one or more junior student assistants. The junior students assist especially in the sterilization and preparation of instruments, surgical dressings and the field of operation. They also assist the senior students in the general handling and care of the animal.

A spacious hospital with modern equipment is maintained for this work. There is ample provision for housing horses, cattle, sheep, swine and small animal patients. All the classroom work in surgery is con-

ducted in the amphitheatre in the hospital building where animals affected with diseases under discussion, as well as instruments, and apparatus to be used in diagnosis, treatment or restraint can be brought before the class. Clinic cases are constantly used to correlate the theoretical and the practical.

A special laboratory is conducted in which students are required to perform practically every operation employed upon both large and small animals including poultry. By this means the student acquires a practical surgical training.

### Description of Courses

371. **General Surgery.** Fundamental principles. Prerequisite: First two years of the Veterinary Curriculum. Fall. Rec. 6. Credit 6.

372, 373. **Special Surgery.** Surgical diseases of the horse, ox, sheep, swine, dog, cat, and fowl. Prerequisite: 371. (372) Winter. Rec. 4. Lab. 1, 3 hr. Credit 5. (373) Spring. Rec. 6. Lab. 1, 3 hr. Credit 7.

381, 382, 383. **Surgical Clinics.** Practice in the general principles of surgery and observation of surgical diseases, their treatment and progress. Prerequisite: First two years of Veterinary Curriculum. Fall, Winter, Spring, respectively. Lab. 6, 2 hr. Credit 1 each course.

477. **Advanced Surgery.** For senior students who desire additional training in surgery. Assigned reading, group discussions, and special laboratory work. Course taught by the Departments of Veterinary Anatomy and Veterinary Surgery. Prerequisite: three years of Vet. Med. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3.

481, 482, 483. **Surgical Clinics.** Continuation of 383. Practical application of special surgical technique. Prerequisite: 383. Fall, Winter, Spring, respectively. Lab. 6, 3 hr. Credit 2 each course.

490. **Ophthalmology.** Methods of examination and diseases of the eye of domestic animals. Prerequisite: 373. Fall. Lect. 2. Credit 2.

677. **Research.** Mr. Fowler.

## VETERINARY CLINICS

CHARLES MURRAY, Chairman

Professors Covault, Walsh, Fowler; Assistant Professors Anderson, Smith, Johnson

Veterinary Clinics include both surgical and medical clinics for large and small animals. The hospital building is well lighted and accommodates 36 horses, 48 small animals, 8 sheep and swine at one time. A cattle wing of a new clinic building has been completed with stall capacity for 35 animals as well as clinic rooms and stock. Two clinic rooms and two operating rooms are contained in these buildings and are well equipped with operating tables, stocks, mats, and other modern equipment. A dispensary and instrument room conveniently located is in charge of a graduate pharmacist during clinic hours.

All operating rooms are equipped with steam sterilizers, operating instruments, and other modern equipment. The floors and walls are of such construction as to enable the best possible sanitary conditions to be maintained.

For those cases which cannot be brought to the hospital, two automobiles are maintained so that students may be taken to the farms and help with the treatment of the various diseases under actual farm con-

ditions. From ten to twelve thousand cases are visited in this way each year. Two or three thousand cases are brought to the hospital annually.

The rich livestock producing area about the college provides an abundance of clinical material of a variety usually found in the veterinary practitioner's work.

## VOCATIONAL EDUCATION

BARTON MORGAN, Director of Teacher Training, Agricultural Annex

Professors F. E. Brown, Evans, Fox, Gaskill, Hunter, Lancelot, Cora B. Miller, Tilden, Vance, Veenker; Associate Professors Dietz, J. E. Foster, Friant, Fritz, Hamlin, Lauer, Otopalik, E. D. Ross, Sexauer, Sharp, Starrak, Turner; Assistant Professors Chadderdon, Daniells, Myrtle H. Foster, Elizabeth Fuller, Hausrath, Hendrickson, Livingston, Lyle, H. J. Schmidt, Truskowski; Instructor Moorehouse

*For information concerning the Division of Agriculture, see page 120.*

The department of Vocational Education administers two curricula especially designed for the training of teachers; namely, the curriculum in Agricultural Education and the curriculum in Agriculture and Science. The courses for the special training of general and vocational teachers of Home Economics are administered in the Division of Home Economics, but the general teacher training work is provided by this department. In like manner the special courses needed by those preparing to teach the Industrial Arts are organized in the Division of Engineering, the general teacher training work being provided by this department.

Graduation from a vocational educational curriculum, or the completion of  $22\frac{1}{2}$  credits of approved work in psychology (9 credits) and vocational education ( $13\frac{1}{2}$  credits), including directed observation and practice teaching, taken in connection with any four-year college curriculum will entitle the student to a standard secondary certificate in Iowa without examination. For Teachers' Certificate, see page 337.

The work in education at Iowa State College was organized in the Division of Agriculture after the passage of the Nelson Amendment to the Morrill Act, which provided funds for the training of secondary teachers of agriculture and home economics. Additional legislation has provided for the training of secondary teachers and supervisors in the three vocational fields, agriculture, home economics, and trades and industry.

### Curriculum In Agricultural Education

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

Six months of practical work in agriculture is required before graduation. See page 177.

## FRESHMAN YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101 <sup>1</sup>	2	A.H. 102	2	A.H. 103	2
Crop Production		Crop Production		General Horticulture	
F.C. 104	4	F.C. 105	4	Hort. 114	3
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
General Botany		Animal Biology		Farm Dairying	
Bot. 101	3	Zool. 114	3	D.I. 114	4
*Drawing and Projection		Gen. Poultry Husbandry		Mathematics	
Engr.Dr. 131	2	A.H. 144	3	Math. 205	4
Military 121	1	Military 122	1	Military 123	1
	<hr/> 15		<hr/> 16		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Orientation, Ag. 101, 102; Ag. 104, see page 177.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

General Chemistry		General Chemistry		Qualitative Analysis	
Chem. 101	4	Chem. 102	4	Chem. 103	4
Gen. Agr. Economics		Gen. Agr. Economics		Gen. Agr. Economics	
Ec. 231	3	Ec. 232	3	Ec. 233	3
Breeds of Livestock		*Farm Mechanics		*Carpentry	
A.H. 205	4	A.E. 254	2	A.E. 155	2
Physics		Plan. Home Landscapes		Forage Crops	
Phys. 204	3	L.A. 206	2	F.C. 214	4
Survey of Ag. Ed.		Technical Journalism		General Psychology	
Voc.Ed. 211	1	T.Jl. 225	3	Psych. 204	3
Military 221	1	Military 222	1	Military 223	1
	<hr/> 16		<hr/> 15		<hr/> 17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

\*The shop subjects may be replaced by a sequence of subjects, chosen with the approval of the head of the department, designed to provide a substitute teaching line for those who do not wish to qualify to teach Farm Mechanics.

## JUNIOR YEAR

Principles of Education		Methods of Teaching		Teaching Agriculture	
Voc.Ed. 304	3	Voc.Ed. 305	4	Voc.Ed. 307	3
Psychology of Learning		Psych. of Motivation		Farm Mgt. and Acctg.	
Psych. 334	3	Psych. 335	3	Ec. 336	3
American Government		Extempore Speaking		Extempore Speaking	
Govt. 315	3	P.S. 311	2	P.S. 312	2
Soils		Fertility and Fertilizers		Animal Feeding	
Soils 254	3	Soils 354	5	A.H. 414	5
Organic and Quantitative		†Co-operation in Agric.		†Elem. Entomology	
Chem. 255	3	Ec. 335	3	Zool. 274	4
*Concrete and Masonry					
A.E. 374	2				
	<hr/> 17		<hr/> 17		<hr/> 17

†May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 301.

\*The shop subjects may be replaced by a sequence of subjects, chosen with the approval of the head of the department, designed to provide a substitute teaching line for those who do not wish to qualify to teach Farm Mechanics.

## SENIOR YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits <sup>2</sup>		Credits		Credits
Teaching Agriculture		Teaching Agriculture		Princ. Sec. Education	
Voc.Ed. 424	3	Voc.Ed. 425	5	Voc.Ed. 426	3
Agricultural Policy		Farm Bldgs. and Equip.		Adv. Farm Org. & Mgt.	
Ec. 547	3	A.E. 489	3	Ec. 580	3
Farm Mach. and Motors		General Genetics		Municipal, Rural San.	
A.E. 384	4	Gen. 300	3	Bact. 537	3
Principles of Sociology				*Teach. Manual Training	
Ec. 384	3			I.A. 515	3
Electives	4	Electives	6	Electives	5
	<u>17</u>		<u>17</u>		<u>17</u>

In all cases it is desirable that the student confer with the head of the department before making his choice of electives.

Note: Any student entering with advanced credits will be expected to earn at least six quarter credits in education before graduation.

Recommended electives: A.E. 345, 356; A.H. 125, 387, 425, 427; Bot. 207, 354; Ec. 384, 384, 385, 484, 535, 586, 587; F.C. 204, 414; For. 100; Hist. 211, 212, 213, 324; Hort. 164A; Zool. 374.

\*The shop subjects may be replaced by a sequence of subjects, chosen with the approval of the head of the department, designed to provide a substitute teaching line for those who do not wish to qualify to teach Farm Mechanics.

## Curriculum In Agriculture and Science

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 99.

This curriculum provides training suited to the needs of men desiring to work in rural consolidated schools, or in other schools attended by relatively large numbers of rural pupils. It includes a major, amounting to 45 credits in agriculture, a required sequence of 30 credits in rural social science, and a minor of approximately 24 credits, selected by the student from a list of 14 such sequences offered by various departments of the College. As a result, students completing this curriculum will be able to teach at least two other subjects in addition to agriculture. It leads to the standard secondary certificate.†

## FRESHMAN YEAR

Livestock Problems		Livestock Problems		Livestock Problems	
A.H. 101 <sup>1</sup>	2	A.H. 102	2	A.H. 103	2
Crop Production		Mathematics		Crop Production	
F.C. 104	4	Math. 205	4	F.C. 105	4
Composition		Composition		Composition	
Engl. 101	3	Engl. 102	3	Engl. 103	3
General Biology		General Biology		†Physics	
Zool. 104	3	Zool. 105	3	Phys. 204	3
General Horticulture		Rural Land. Design		General Botany	
Hort. 114	3	L.A. 208	3	Bot. 101	3
Military 121	1	Military 122	1	Military 123	1
	<u>16</u>		<u>16</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Voc.Ed. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 177.

†At the beginning of the Sophomore year the student will choose a minor of 24 credits to be completed during the Sophomore, Junior, and Senior years. In certain instances courses which would otherwise be included in the minor are listed among the required courses above. In such cases, the minor is correspondingly reduced. The essential character of these elective minors is shown on page 382.

†May be omitted by students who expect to elect a minor in Physics.

<sup>1</sup>The number refers to the description of the course.

<sup>2</sup>For definition of a credit, see page 164.

## SOPHOMORE YEAR

Fall Quarter		Winter Quarter		Spring Quarter	
	Credits		Credits		Credits
Gen. Agr. Economics Ec. 281	3	Gen. Agr. Economics Ec. 282	3	Gen. Agr. Economics Ec. 288	3
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
General Psychology Psych. 204	3	Psychology of Learning Psych. 334	3	Psych. of Motivation Psych. 385	3
Technical Journalism T.Jl. 225	3	Extempore Speaking P.S. 311	3	Extempore Speaking P.S. 312	2
Military 221	1	Military 222	1	Military 223	1
Electives	3	Electives	3	Electives	3
	<u>17</u>		<u>17</u>		<u>16</u>

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

## JUNIOR YEAR

Soils Soils 254	3	General Bacteriology Bact. 304A	5	Fertility and Fertilizers Soils 354	5
Organic and Quantitative *Chem. 255	3	Co-operation in Agr. Ec. 335	3	Farm Mgt. & Accounting Ec. 336	3
Principles of Education Voc.Ed. 304	3	Methods of Teaching Voc.Ed. 305	4	Teaching General Agr. Voc.Ed. 521	3
Land Economics Ec. 334	3				
Electives	5	Electives	5	Electives	6
	<u>17</u>		<u>17</u>		<u>17</u>

\*In case a minor in Chemistry is elected, Chem. 255 will not be required.

## SENIOR YEAR

Teaching Agriculture Voc.Ed. 522	3	Princ. of Secondary Educ. Voc.Ed. 306	3	Animal Feeding A.H. 414	5
Teaching Agriculture Voc.Ed. 523	3	Agricultural Finance Ec. 535	3		
Agricultural Policy Ec. 547	3	American Government Govt. 315	3		
Principles of Sociology Ec. 384	3				
Electives	5	Electives	3	Electives	12
	<u>17</u>		<u>17</u>		<u>17</u>

## LIST OF MINORS OFFERED

In Bacteriology:	Bact. 304A, 5 cr.; 350, 4 cr.; 534, 3 cr.; 536, 4 or 5 cr.; 537, 3 cr.; 564, 5 cr.
In Biological Science:	Bot. 101, 3 cr.; 102, 3 cr.; Gen. 300, 3 cr.; Bact. 537, 3 cr.; Zool. 374, 4 cr.
In Botany:	Bot. 101, 3 cr.; 102, 3 cr.; 103, 3 cr.; 206, 4 cr.; 207, 4 cr.; 424, 3 or 4 cr.
In Chemistry:	Chem. 211, 4 cr.; 212, 4 cr.; 213, 4 cr.; 331, 5 cr.; 332, 5 cr.; 333, 5 cr.
In English:	Engl. 254 or 255, 3 cr.; 205, 3 cr.; 304, 3 cr.; 354 or 364, 3 cr.; 455, 3 cr.; 456, 3 cr.; 464, 3 cr.; 466, 3 cr.
In Genetics:	Math. 101, 5 cr.; 441, 3 cr.; Bot. 404 or Zool. 534, 3 cr.; Gen. 300, 3 cr.; 305, 1 cr.; 530, 3 cr.; 535, 3 cr.; 540, 1 to 3 cr.; Bact. 304D, 3 cr.; Zool. 203, 3 cr.
In Geology:	Geol. 324, 4 cr.; 375, 3 cr.; 202, 4 cr.; 434, 4 cr.; 455, 4 cr.; or 311, 3 cr.; 312, 3 cr.; 318, 3 cr.
In Economic History:	Hist. 211, 3 cr.; 212, 3 cr.; 213, 3 cr.; 421, 3 cr.; 422, 3 cr.; 423, 3 cr.; 534, 3 cr.; 554, 3 cr.; 555, 3 cr.
In Journalism:	T.Jl. 221, 4 cr.; 222, 4 cr.; 223, 4 cr.; 335, 3 cr.; 465, 3 cr.; 341, 2 cr.; 342, 2 cr.; 343, 2 cr.; Elective in T.Jl., 3 cr.
In Manual Arts:	A.E. 155, 2 cr.; 254, 2 cr.; 356, 3 cr.; 334, 4 cr.; 345, 3 cr.; 374, 2 cr. I.A. 106, 3 cr.; 515, 3 cr.; Engr. Dr. 181, 2 cr.
In Mathematics:	Math. 101, 5 cr.; 102A, 5 cr.; 103, 5 cr.; 211, 4 cr.; 212, 4 cr.
In Physics:	Phys. 211, 4 cr.; 212, 4 cr.; 213, 4 cr.; 404, 2 cr.; 405, 1 cr.; 498, 3 cr. 524, 3 cr.
In Public Speaking:	P.S. 104, 2 cr.; 254, 3 cr.; Electives in P.S., 12 cr.
In Zoology:	Zool. 203, 3 cr.; 255, 5 cr.; 274, 4 cr.; 374, 4 cr.; 534, 4 cr.

## Description of Courses

The work of the department is in the following fields:

Agricultural Education—211, 307, 424, 425, 431, 437, 521, 522, 523, 536, 537, 544, 545, 604, 626, 644, 645.

Vocational Education—304, 305, 417, 426, 534, 535, 554, 561, 562, 563, 584, 624, 625, 664, 684.

Home Economics Education—406, 407, 504, 506, 508, 509, 528, 605, 606, 607, 610, 614.

Industrial Arts—317, 318, 408, 510, 515, 516, 518, 524, 525, 600, 608, 609, 615, 616, 617, 650.

Industrial Science courses—417, Bot. 494, Chem. 495, Engl. 394, Hist. 496, Math. 497, Phys. 498, Zool. 499.

Physical Education—327, 328, 411, 412, 413, 491, 492, 493.

Psychology—204, 206, 334, 335, 434, 530, 634, 635, 636.

204. General Psychology. (Psych. 204.) Study of normal human behavior. Fundamental to all other courses in Psychology. Fall, Winter, Spring. Rec. 3. Credit 3.

206. Laboratory in General Psychology. (Psych. 206.) A laboratory course paralleling or following 204. Rec. 1. Lab. 1, 2 hr. Credit 2. Spring.

211. Observation and Survey of Agricultural Education. First-hand contacts with the work of the teacher of agriculture. Lab. 1, 3 hr. Credit 1. Fall.

304. Principles of Education. Objectives and organization of modern secondary schools as they affect vocational and science teachers. Prerequisite: a quality point average of 2.1. Fall, Winter, Spring. Rec. 3. Credit 3.

305. Methods of Teaching Vocational Subjects. Special emphasis upon principles of motivated problem teaching. Prerequisite: 304. Fall, Winter, Spring. Rec. 4. Credit 4.

307. Special Methods of Agricultural Education. General objectives, programs, and relationships; the high school program of agricultural education. Discussions based upon field observations. Prerequisite: credit or classification in 305. Winter, Spring. Rec. and lab. 2, 3 hr. Credit 3.

317. Social Significance of Industrial Education. (I. A. 317.) The social influences bearing on industrial education and the reaction of this form of education on society itself. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

318. Trade Analysis. (I. A. 318.) Basic types of analyses. Preparation of instruction sheets for teaching trade subjects. Prerequisite: Senior college classification. Winter. Rec. 3. Credit 3.

327. Theory and Practice of Coaching. (Phys. Ed. 327.) Survey of coaching field. Coaching technique and officiating. Application of rules, plays, and coaching principles. Alternate years. Offered Winter, 1937. Lect. 2. Lab. 1, 3 hr. Credit 3.

328. Special Problems in Teaching Physical Education. (Phys. Ed. 328 for Women.) Alternate years. Offered Spring, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3.

334. Educational Psychology. (Psych. 334.) The various concepts of learning and improvement. Psychology of high school subjects. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3.

335. Educational Psychology. (Psych. 335.) The treatment of the psychological factors involved in motivation and educational efficiency. Prerequisite: 334. Winter. Rec. 3. Credit 3.

394. The Teaching of English. (Engl. 394.) For students preparing to teach English in addition to other subjects. The teaching of literature and composition. Prerequisite: a quality point average of 2.5 in Engl. 255, 364 or 464, and 205 or 304. Spring. Rec. 3. Credit 3.

406. Methods of Teaching Home Economics. (H. Ec. Ed. 406.) Objectives for home economics courses in high school. Selection of problems for realizing objectives. Methods of presenting problems. Uses of objective material. Directed observation and participation in teaching. Prerequisite: 305, and completion of two quarters of Junior year. Rec. 3. Lab. 1 as arranged. Credit 4.

407. Supervised Teaching in Home Economics. (H. Ec. Ed. 407.) Supervised teaching in public schools having co-operative agreement. Prerequisite: Credit or classification in 406. Fall, Winter, Spring. Lab. as arranged. Credit 4.

408. Foundations of Industrial Education. (I. A. 408.) Development of the movement; the Smith-Hughes Act, state plans and laws relating to industrial education. Spring. Rec. 3. Credit 3.

411, 412, 413. **Supervised Teaching in Physical Education.** (Phys. Ed. 411, 412, 413.) Practice with school and college groups. Fall, Winter, Spring, respectively. Lab. 6. Credit 1 or 2 each quarter.

417. **Directed Observation and Practice Teaching in the Sciences.** (I. S. 417.) Observation, evaluation of instruction, lesson planning and classroom teaching in the sciences. Prerequisite: 305, or equivalent, special methods, and 20 credits in subject matter field. To be arranged in advance. Fall, Winter, Spring. Credit 5.

424, 425. **Observation and Practice Teaching in Agriculture.** Observations of part-time and evening classes; analysis of methods employed; full-time practice teaching in public high schools. (424) Prerequisite: 307 Rec. and lab. 2, 3 hrs. Credit 3. Fall. (425) Prerequisite: 307. To be scheduled only with "as arranged" courses. Lab. as arranged. Credit 5.

426. **Principles of Secondary Education.** With special reference to the relationships sustained by vocational and science teachers in connection with the organization and management of the senior high school. Prerequisite: 304. Fall, Winter, Spring. Rec. 3. Credit 3.

431. **Special Problems in Agricultural Education.** Prerequisite: 307. Fall, Winter, Spring. Credit 1 to 5.

434. **Tests and Educational Measurement.** (Psych. 434.) Treatment of tests and their application in educational, vocational, and industrial guidance and selection. Important for teachers, employers, and vocational counselors. Prerequisite: 204. Fall, Spring. Rec. 3. Credit 3.

437. **Rural Educational Services.** Educational services available from colleges and universities, public schools, libraries, farm organizations, and federal and state departments of agriculture. Special emphasis is placed upon techniques and administration of extension services of land-grant colleges. Prerequisite: Senior college classification. Winter. Rec. 3. Credit 3.

491. **Principles of Physical Education.** (Phys. Ed. 491 for Men.) Interpretation of objectives of physical education and health education. Analysis of activities in terms of developmental objectives. Prerequisite: Zool. 255, Voc. Ed. 304. Alternate years. Offered Fall, 1937. Rec. 3. Credit 3.

492. **Methods of Teaching Physical Education.** (Phys. Ed. 492 for Men.) Application of general education methods to physical education. Special methods of teaching activities not covered in 314, 315, 316, 317. Prerequisite: Psych. 334, 335. Alternate years. Offered Winter, 1938. Rec. 3. Credit 3.

493. **Organization and Administration.** (Phys. Ed. 493.) Organization and administration of physical education and athletics. Program for required and elective courses, intramural and interschool athletics. Athletic management. Prerequisite: Phys. Ed. 201, 202, 203. Alternate years. Offered Spring, 1938. Lect. 3. Credit 3.

494. **Methods of Teaching Botany.** (Bot. 494.) Prerequisite: 15 credits of botany. Spring. Rec. 3. Credit 3.

495. **Teaching Chemistry.** (Chem. 495.) Methods of presentation and study of subject matter supported by class and laboratory demonstration. Prerequisite: 15 credits of chemistry including Chem. 211 or 331, or equivalent. Lect and rec. 2. Lab. 1, 3 hr. Credit 3.

496. **Methods of Teaching the Social Sciences.** (Hist. 496.) Methods of teaching history, government, economics, and sociology in the high school and the junior college. Prerequisite: Fifteen credits of history including Hist. 211, 212, 213, or equivalent; Govt. 315; Ec. 201, 202. Alternate years. Offered Spring, 1939. Rec. 3. Credit 3.

497. **Teaching Vocational Mathematics in Junior and Senior High Schools.** (Math. 497.) Several practical aspects of teaching mathematics such as organization of subject matter, methods of presenting typical topics, and tests for measuring results. Prerequisite: 15 credits of college mathematics. Spring. Lecture and observation 3. Credit 3.

498. **Teaching of Physics.** (Phys. 498.) A technique course. To acquaint prospective teachers with the recent educational advances in methods as they apply to the teaching of physics. A study of the content of the high school physics, and practice in presentation of various topics. Prerequisite 15 credits of physics including Phys. 211, 212, 213, or equivalent. Winter. Lect. and rec. 3. Credit 3.

499. **Methods in Teaching Animal Biology and Physiology.** (Zool. 499.) Study and observation of methods and practical devices in teaching. Prerequisite: 15 credits of zoology including one year of introductory biology. Spring. Rec. 3. Credit 3.

504. **Special Topics in Home Economics Education** (H. Ec. Ed. 504). Prerequisite: 406. Miss Miller.



506. **Teaching Human Relationships in the Public Schools.** (H. Ec. Ed. 506.) Objectives, selection of material, and problem organization of courses in human relationships, including family and community relationships, child care, and personality development. Prerequisite: 407, C. D. 435, H. Mgt. 474, or equivalent. Summer, second term. Rec. 6. Credit 3. Miss Turner.

508. **Methods of Teaching Adult Homemaking Classes.** (H. Ec. 508.) Place of Home Economics in the adult program. Organization of adult classes. Planning units of work—observation of adult classes. Prerequisite: Credit or classification in 406. Winter, Spring. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3. Miss Lyle.

509. **The Home Economics Movement.** (H. Ec. Ed. 509.) The development of home economics in relation to the education of women. Reports of present day fields in which home economics is active. Spring. Rec. 2. Credit 2. Miss Fisher.

510. **Technique of Teaching Trades.** (I. A. 510.) The teaching processes, methods of presentation and testing, lesson planning, organization for instruction. Spring. Rec. 3. Credit 3. Mr. Baird.

515, 516. **Teaching Industrial Arts.** (I. A. 515, 516.) Curricula, observation, supervised teaching, demonstrations, organization, and administration. Prerequisite: 305, or equivalent. Fall, Winter, respectively. Rec. and lab. 3. Credit 3. each course. Mr. Sharp, Mr. Hunter.

518. **Problems in Industrial Education.** (I. A. 518.) Administration and supervision of industrial education programs in public schools. Spring. Rec. 3. Credit 3. Mr. Baird.

521, 522, 523. **Teaching General Agriculture.** Curricula in general agriculture, methods, observation, and supervised teaching. Prerequisite: 305. (521) Fall, (522) Winter. Rec. 3. Credit 3 each course. (523) Fall, Winter, Spring. Lab. as arranged. Should be arranged in advance. Mr. Hamlin, Mr. Hausrath.

524. **Industrial Conference Methods.** (I. A. 524.) Use of the conference method in instruction. Study and practice of conference procedure, devices, and technique. Prerequisite: industrial or industrial teaching experience. Summer. Rec. 6. Credit 3. Mr. Baird.

525. **Problems in Part-Time Education.** (I. A. 525.) Demands upon supervisors, principals, teachers, and co-ordinators working in the field of part-time schools for employed minors. Winter. Rec. 3. Credit 3. Mr. Baird.

528. **Methods for Vocational Teachers.** (H. Ec. Ed. 528.) Philosophy of vocational education, home projects, teaching of related subjects. Prerequisite: 305. Winter, Spring. Rec. 3. Credit 3. Miss Chadderon.

530. **Psychology of Skill.** (Psych. 530.) The development of skill and skill techniques. Habit making and breaking; transfer of training and its principles; mechanical aptitudes and intelligence. Principles of motivation effective in the shop; development of muscular co-ordination. Laboratory methods and demonstrations. Prerequisite: 204. Alternate years. Offered Winter, 1939. Rec. 3. Credit 3. Mr. Evans.

534. **Administration of the Guidance Program.** Principles and practices in aiding students to make educational and vocational adjustments; occupational studies; testing and records; counseling; group guidance and follow-up. Rec. 3 to 5. Credit 3 to 5. Summer and Saturday classes. Mr. Hausrath.

535. **Administration of the Testing Program.** Methods of measuring educational outcomes: types of tests and their construction; use and interpretation of tests in teaching. Rec. 3 to 5. Credit 3 to 5. Summer and Saturday classes. Mr. Starzak.

536. **Adult Education.** Survey of current trends and present activities in field of adult education, special problems and practices in conducting adult education programs. Rec. 3 to 5. Credit 3 to 5. Summer and Saturday classes. Mr. Sexauer.

537. **Methods of Teaching Adults.** Principles and best practices. Conducting forums, leading group discussions, using visual aids, and teaching short unit courses. Prerequisite: 305, or equivalent. Summer, first term and Saturday classes. Rec. 3 to 5. Credit 3 to 5. Mr. Sexauer.

542. **Administration of Village and Consolidated High Schools.** Organization of teaching staff, pupil classification, disciplinary problems, records and reports, extra-curricular activities, and management of library. Prerequisite: 306 or equivalent. Summer, first and second terms and Saturday classes. Rec. 3 to 5. Credit 3 to 5. Mr. Hausrath.

544. **Administration of Village and Consolidated Schools.** Fiscal administration in local school systems, equipment and supplies, building and grounds, transportation, curriculum, school and community activities, information service. Summer and Saturday classes. Rec. 3 to 5. Credit 3 to 5. Mr. Morgan.

545. **Supervision of Rural Elementary Education.** Special emphasis upon reading, arithmetic, and social studies. Prerequisite: 305 or equivalent. Summer, first term and Saturday classes. Rec. 3 to 5. Credit 3 to 5. Mr. Morgan.

547. **Supervision of Rural Secondary Education.** Primarily for high school principals and superintendents of village and consolidated schools. Prerequisite: 305 or equivalent. Summer first and second terms and Saturday classes. Rec. 3 to 5. Credit 3 to 5. Mr. Starrak.

554. **Administration of Vocational Education.** Development and present best practice, prevocational education, vocational guidance, and vocational training. Summer and Saturday classes. Rec. 3 to 5. Credit 3 to 5. Mr. Morgan, Mr. Hamlin.

561, 562, 563. **Methods of Teaching College Subjects.** With special reference to the use of motivated problems in presenting technical subjects. Fall, Winter, Spring, respectively. Rec. 1 to 3. Credit 1 to 3, each course. Mr. Starrak, Mr. Sexauer.

584. **History of Industrial and Vocational Education.** Chief emphasis upon the modern movement. Winter. Rec. 3. Credit 3. Mr. Morgan.

600. **Problems in Industrial Arts Education.** (I. A. 600.) Summary of recent findings of research; methods of attack on new problems. Fall. Rec. 3. Credit 3. Mr. Hunter.

604. **Administration of Agricultural Education.** Objectives, curriculum, relationships with public schools and with state and federal agencies; and other similar problems. Summer, first term. Rec. 6. Credit 3. Mr. Hamlin, Mr. Sexauer.

605. **Home Economics Curricula.** (H. Ec. Ed. 605.) Survey of public school home economics curricula and recent curriculum studies. Technique of curriculum building. Objectives and problems for specific courses. Prerequisite: credit or classification in 562. Spring. Rec. 3. Credit 3. Miss Turner.

606. **Technique of Supervision.** (H. Ec. Ed. 606.) Objectives, techniques, and organization of teacher training supervision and state supervision. Prerequisite: 407 or equivalent. Spring. Credit 3 to 6. Miss Friant.

607. **Survey Course in Methods of Teaching Home Economics in the Public Schools.** (H. Ec. Ed. 607.) Investigation and reports of present day trends in methods of teaching home economics. Prerequisite: teaching experience. Summer, first term. Rec. 5. Credit 2. Miss Miller.

608. **Advanced Teaching Problems in Industrial Arts.** (I. A. 608.) Supervision, teaching, and promotion of industrial arts, including a study of successful systems now in use. Prerequisite: undergraduate major or minor in education or psychology. Summer. Rec. 6. Credit 3. Mr. Hunter.

609. **Historical Research in Industrial Education.** (I. A. 609.) Original sources for historical research, individual problems, appreciation of the historical foundation of industrial education, significant movements in Europe and America. Summer. Rec. 6. Credit 3. Mr. Livingston.

610. **Seminar in Home Economics Education.** (H. Ec. Ed. 610.) Credit and hours as arranged. Miss Friant.

614. **Research in Home Economics Education.** (H. Ec. Ed. 614.) Misses Miller, Friant, Turner, Chadderdon.

617. **Curriculum Building in Industrial Education.** (I. A. 617.) Organization of curricula for shop and related technical instruction in trade technical schools or classes. Prerequisite: 318, or equivalent. Winter. Rec. 3. Credit 3. Mr. Hunter.

624. **Research Methods in Vocational Education.** Adaptation of research technique to problems in vocational education. Fall. Rec. 3. Credit 3. Mr. Hamlin, Mr. Starrak.

625. **Research in Vocational Education.** Prerequisite: 624. Messrs. Lancelot, Hamlin, Starrak, Morgan.

626. **Research in the Administration or Supervision of Rural Education.** Prerequisite: 624. Messrs. Hamlin, Morgan, Sexauer.

634. **Educational Psychology.** (Psych. 634.) The various concepts of learning and improvement. Psychology of high school subjects. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3. Graduates who have not had 334. Mr. Fritz, Mr. Lauer.

635. **Educational Psychology.** (Psych. 635.) Treatment of the psychological factors involved in motivation and educational efficiency. Prerequisite: 334 or 634. Winter. Rec. 3. Credit 3. Graduates who have not had 335. Mr. Fritz.

636. **Educational Psychology.** (Psych. 636.) A critical view of the psychology of mass education as it concerns group action, crowd behavior, co-operation, social participation; psychology of modern leisure and culture. Prerequisite: 334 or 634. Alternate years. Offered Fall, 1938. Rec. 3. Credit 3. Mr. Evans, Mr. Vance.

644. **Administrative Organization and Finance of Rural Education.** State and county school systems, inequalities, centralization and consolidation, state and federal aid plans for raising and distributing school funds. Summer and Saturday classes. Rec. 2 to 5. Credit 2 to 5. Mr. Morgan.

650. **Research in Industrial Arts Education.** (I. A. 650.) Messrs. Hunter, Livingston.

664. **College Administration Problems.** Lectures and discussions relating to college and university administration for the general information of graduate students expecting to enter the profession of teaching. Winter. Rec. 3. Credit 3. Mr. R. M. Hughes, Mr. Friley.

684. **Current Educational Movements.** Major trends and problems in modern education. Selection of special courses and problems for graduate research. Fall and Saturday classes. Rec. 3 to 5. Credit 3 to 5. Messrs. Hamlin, Starrak, Sexauer.

## TEACHERS' CERTIFICATES

**STATE CERTIFICATES.** In accordance with the law passed by the Forty-fifth General Assembly, the State Board of Educational Examiners will grant a standard secondary certificate to any graduate of the Iowa State College who has completed the following work.

	Quarter Credits
1. Professional training	
a. Introduction to, history of, or principles of education	4½
b. Psychology and its application to education	9
c. Methods of teaching	4½
d. Directed observation and supervised student teaching	4½
	<hr/> 22½

Note. In addition to the above requirements, each candidate for a state certificate must have taken a college course in the Fundamental Principles of a Republican Form of Government and the Constitution of the United States and of the State of Iowa. This requirement is met by credit in Government 315.

## Teacher Placement

The Committee on Appointments seeks (1) to aid adequately prepared students and graduates in securing positions as teachers; (2) to give service to superintendents and school boards who are in need of teachers. Calls for teachers are referred to this committee. The fee for enrollment is \$2.00 for residents of Ames and \$4.00 for non-residents. Those wishing to enroll should apply at Room 203, Agricultural Annex.

## ZOOLOGY AND ENTOMOLOGY

C. J. DRAKE, Head of Department

Professors Becker, Knight, Richardson, Wellhouse; Associate Professors Harris, Lucas, Park, Smith; Assistant Professors Hendrickson, Tauber; Instructors Adams, Andre, Hager, Roudabush; Graduate Assistants Fisher, Gunderson, Patterson, Snipes, Tuthill; Teaching Fellows Clare, Jones, Paul  
Extension Workers Decker, Hansberry, Paddock, Worthington

*For information concerning the Division of Industrial Science, see page 131.*

The work in the department as a whole is largely foundation work, which gives that knowledge of the biological laws and the data necessary for profitable specialization in the lines of animal husbandry, veterinary medicine, and home economics, as well as other lines in industrial science and agriculture. For this work the zoological laboratories are well equipped with apparatus and materials.

The department also offers special training in a number of applied subjects, such as economic zoology, parasitology, protozoology, physiology, entomology, and apiculture, in which students may specialize and prepare for important positions in government, state, municipal, or industrial work. For men and women proficient in such lines, there has always been a greater demand than could be supplied.

The instruction in zoology, physiology, entomology, and apiculture is given in Science Hall.

### Curriculum in Industrial Science—Major Zoology

For Freshman and Sophomore years, see page 285.

For general directions concerning work of Junior and Senior years, see page 286.

### Graduate Curricula

For general information concerning graduate work, see page 162. A full description of this work is given in the graduate catalogue. Graduate curricula leading to the degrees of Master of Science and Doctor of Philosophy are offered in the fields of animal biology, morphology, ecology, taxonomy, physiology (comparative and insect physiology), protozoology, parasitology, entomology, apiculture, and economic zoology.

### Description of Courses

104, 105. **General Biology.** Introduction to the foundations of life; the laws of nature as revealed in the simplest living organisms and in the higher animals. (104) Fall, Winter, Spring. (105) Winter, Spring. Lecture 2. Lab. 1, 3 hr. Credit 3 each course.

111, 112, 113. **Animal Biology.** General zoology including observation and study of the life activities of representative animals with discussion of the fundamental principles of animal life. For Industrial Science students, particularly, majors in zoology and Pre veterinary and Premedical students. Fall, Winter, Spring, respectively. Rec. 2. Lab. 2, 3 hr. Credit 4 each course.

114, 115. **Animal Biology.** The biological principles as illustrated in the bodily make-up, life functions and habits of representatives of the main animal groups, with emphasis on their relation to man and his economy. Designed for students in Agriculture, Forestry, and Industrial Science. (114) Fall, Winter. (115) Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3 each course.

203. **Human Biology.** An outline of evolution from sub-human to human, the fossil record, the anatomy and embryonic development of the human body. Prerequisite: 105, or equivalent. Spring. Rec. 3. Credit 3.

224. **Comparative Anatomy.** A comparative study of the anatomy of the vertebrates. Dissection of principal types and demonstration of special structures. Prerequisite: General or animal biology. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

234. **Embryology.** Fundamentals of animal development, mainly of vertebrates; germ cell origin and structure, maturation, fertilization, cleavage, cell layers, tissue and organ formation, foetal membranes and their uses. Prerequisite: General or animal biology. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4.

255. **Physiology of the Human Body.** A general course covering the fundamental facts and principles of physiology, primarily for students of Home Economics and Industrial Science. Prerequisite: 104, 111, or 114; and Chem. 102 or 106. Fall, Winter, Spring. Lect. 3. Lab. 2, 3 hr. Credit 5.

274. **Elementary Entomology.** Structure, habits, life histories and classification of insects, designed as a foundation for economic or advanced entomology. Fall, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

315. **Bird Study.** Identification, habits, and economic importance of Iowa birds. Birds of the vicinity observed under guidance. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2. Additional lab. 1, 3 hr., with material indoors. Credit 3.

334. **Embryology.** Elements of vertebrate embryology including a summary of the principles of mammalian development. Prerequisite: General or animal biology. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3.

374. **Farm Insects.** The life history, recognition, and control of the principal insects and other arthropods attacking plants and animals. Winter, Spring. Lect. 2. Lab. 2, 3 hr. Credit 4.

375. **Fruit Pests.** Identification, life history and methods of control of the more important insect pests of orchard and small fruits. Prerequisite: 274 or 374. Spring. Rec. 3. Lab. 2, 3 hr. Credit 5.

377. **Forest Insects.** Life histories and habits of the more important insects injurious to forests, forest products, and ornamentals. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

378. **Greenhouse and Truck Crop Pests.** Pests encountered by the florist and market gardener, with control measures adapted to their conditions. Prerequisite: 274. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

384. **Elementary Apiculture.** General principles necessary to the successful operation of a few colonies. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

424. **Histological Technique.** Methods of fixing, sectioning, mounting, and staining tissues for microscopic study. Prerequisite: General or animal biology. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3.

429. **Special Problems in Zoology, Physiology, Entomology, and Apiculture.** Individual problems to begin research and to find the literature. Prerequisite: 113, 115, or equivalent. Credit 2 to 5.

454. **Human Anatomy.** Introductory, using atlases, manikins, and skeletons. Prerequisite: 105 or equivalent. Alternate years. Offered Spring, 1939. Lect. and demonstrations 2. Lab. 1, 3 hr. Credit 3.

456. **Advanced Physiology.** Digestion, excretion, and endocrinology. Prerequisite: 255. Alternate years. Offered Fall, 1937. Lect. and demonstrations 2. Lab. 1, 3 hr. Credit 3.

484. **Insect Morphology.** Gross morphology of typical insects with special attention to structure emphasized in economic and systematic entomology. Prerequisite: 274. Fall. Lab. 3, 3 hr. Credit 3.

499. **Methods in Teaching Animal Biology and Physiology.** (Voc. Ed. 499.) Study and observation of methods and practical devices in teaching. Prerequisite: 15 credits of zoology including one year of introductory biology. Spring. Rec. 3. Credit 3.

**504. Game Birds and Mammals.** Identification of common game species of birds and mammals, including fur-bearers, of North America, particularly of the North-Central States; life histories; habits; general management; game laws. Prerequisite: 105, 113, or 115. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Hendrickson.

**506. Fishes.** Identification of common game and soft fishes, frogs, and mollusks of North America, particularly of North-Central States; life histories; habits; general management; and laws. Prerequisite: 105, 113, or 115. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Hendrickson.

**508. Techniques in Wildlife Management.** Preparation of study mounts of birds, mammals and other game species, food-habits analysis, census methods, collection of data, mapping management areas, and literature. Prerequisite: 504. Winter. Lect. 1. Lab. 2, 3 hr. Credit 3. Mr. Hendrickson.

**510. Parasites of Game Animals.** Identification, life histories, and distribution of protozoan, helminth, and arthropod parasites of game and other wild birds and mammals. Prerequisite: 113. Spring. Lect. 2. Lab. 2, 3 hr. Credit 4. Mr. Becker.

**514. Parasites and Disease Carrying Insects.** Advanced study of pathogenic protozoa, worms, leeches, external parasites and disease-carrying mites and insects. Prerequisite: 105, 113, or 115. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Becker.

**515. Protozoology.** Free-living and parasitic protozoa. Prerequisite: General or animal biology. Fall. Lect. 2. Lab. 2, 3 hr. Credit 4. Mr. Becker.

**516. Field Zoology.** Primarily for students and teachers, to acquaint themselves with the fresh water and land fauna of a locality. Methods of collecting, identifying, and preserving material. Micro-preparation of the smaller invertebrates and animal tissues. Opportunity for making a personal collection for teaching purposes. Prerequisite: general or animal biology. Summer, first term. Lect. 4. Lab. 4, 3 hr. Credit 4. Mr. Becker.

**517. Invertebrate Zoology.** Advanced study of the invertebrate phyla. Economic relations, classification, and structure. Prerequisite: 105, 113, 115, or equivalent. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Becker.

**519. Taxonomy and Ecology of Vertebrates.** Advanced study of classification, habits and relationships of world wide vertebrates, including migration, establishment and range of existing species. Prerequisite: 115. Fall. Lect. 3. Lab. 1, 3 hr. Credit 4. Mr. Hendrickson.

**520. Wildlife Management.** Special reference to game birds. The basic principles in the management of wild game birds and fur-bearing animals. Co-ordination of such management with timber and farm crop production, recreation, and other land uses. Federal and state legislation for the protection of wildlife, with reference to recent trends. Field work in planning of preserves and other land areas; visits to areas under actual management. Prerequisite: 504. Winter. Lect. 3. Lab. 1, 3 hr. Credit 4. Mr. Hendrickson.

**525. Seminar in Zoology, Physiology, and Entomology.** Reports of original investigations, current literature, special features. Fall, Winter, Spring. Credit 1. Mr. Drake.

**526. Cytology.** The cell as related to development and inheritance. Correlation of cell structure with function under normal and pathological conditions. Prerequisite: 113. Alternate years. Offered Spring, 1939. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Lucas.

**527. Normal Histology.** Microscopic structure of the fundamental and special tissues of the vertebrate in relation to development and function. Prerequisite: 113. Winter. Rec. 2. Lab. 2 or 3, 3 hr. Credit 4 or 5. Mr. Becker.

**534. Embryology.** Development, principles and processes, using vertebrate embryos. Germ cell origin and structure, maturation, fertilization, cleavage, differentiation, tissue formation, organogeny. Prerequisite: General or animal biology. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4. Mr. Lucas.

**538. Advanced Embryology.** Mammalian development, emphasizing histogenesis, organogenesis, anatomy of the foetus and anomalies of development. Prerequisite: 234, 334, 534, or equivalent. Alternate years. Offered Spring, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Lucas.

**557. Applied Physiology.** Blood, circulation, and respiration, with special reference to technique. Prerequisite: 255 or equivalent. Alternate years. Offered Spring, 1939. Lect. and demonstrations 2. Lab. 1, 3 hr. Credit 3. Miss Smith.

**558. Child Physiology.** A survey of the processes of growth and development with special reference to inherited and glandular influences. Prerequisite: 255. Winter. Lect. 2. Lab. 1, 3 hr. Credit 3. Miss Smith.

564. **Physiology of the Nervous System.** The brain and spinal cord and the sense organs. Prerequisite: 255. Alternate years. Offered Fall, 1938. Lect. and demonstrations 2. Lab. 1, 3 hr. Credit 3. Miss Smith.

565. **General Animal Physiology.** Life processes of cells and cell groups. Prerequisite: 105 or 113, and one year of Chemistry. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Tauber.

566. **Insect Physiology.** Life processes of insects and related forms. Prerequisite: 484, 565. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4. Mr. Tauber.

576, 577. **Systematic Entomology.** Classification, nomenclature, and taxonomic practice. Students may select a particular group and make a private collection. Prerequisite: 274 or 374. Winter, Spring, respectively. Rec. 1. Lab. 2, 3 hr. Credit 3 each course. Mr. Knight.

578. **Animal Ecology.** Relation of animals to their natural environment; geographical distribution, climatic factors, ecological succession. Field and experimental work. Prerequisite: 113 or 115, 274. Fall. Lect. 3. Lab. 1, 3 hr. Credit 4. Mr. Knight.

585. **Field Entomology.** A survey of the insect world, including classification, life histories, literature, and ecology. Emphasis on field observations and on making and naming a personal collection of insects. Prerequisite: general or animal biology. Summer, second term. Rec. 4. Lab. 4, 3 hr. Credit 4. Mr. Knight.

594. **Advanced Apiculture.** The biology and behavior of the honeybee together with its management for the production of honey. Prerequisite: 274 or 374, and 384. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3. Mr. Park.

595. **Evolution of Animals.** Problems and factors in organic evolution, heredity, variation, origin, and distribution of life. Prerequisite: 424. Spring. Lect. 2. Credit 2. Mr. Wellhouse.

624. **Vertebrate Zoology.** The chordate animals, placing emphasis on morphology and relationships of types. Prerequisite: 113, or equivalent. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Miss Smith.

665. **Insect Toxicology.** Quantitative methods for the study of insect toxicology; theories of the action of poisons; history of insecticides; preparation and application of insecticides. Prerequisite: 274, 374, 566. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Richardson.

674. **Applied Entomology.** Identification, ethology, and geography of insect pests. Principles and methods of chemical and natural control. Prerequisite: 105, 113 or 115, 274, 374. Winter, Spring. Rec. 3. Lab. 1, 3 hr. Credit 4. Mr. Drake.

677. **Literature of Zoology and Entomology.** Review of important literature and classical authors; bibliography, nomenclators and rules of zoological nomenclature. Prerequisite: 113 or 115, and 274, 374. Alternate years. Offered Winter, 1939. Lect. 3. Credit 3. Mr. Knight.

684. **Advanced Insect Morphology.** The structure, development, reproduction, and homologies of various groups of insects. Prerequisite: 484, or equivalent. Winter. Lect. 3. Credit 3. Mr. Wellhouse.

690. **Research.**

A. Zoology. Messrs. Becker, Lucas, Hendrickson, Errington.

B. Physiology. Miss Smith, Mr. Tauber.

C. Entomology. Messrs. Drake, Richardson, Wellhouse, Knight, Harris.

D. Apiculture. Mr. Park.

# Non-Collegiate Work

The curricula described on the following pages are open to young men seventeen or more years of age who have had at least an eighth grade preparation. The primary object of these curricula is to train young men for definite vocational work.

## CURRICULA IN AGRICULTURE

DEAN KILDEE, Agricultural Hall, Room 123N

Four-Quarter Curriculum for Creamery Operators. See page 343.

Two-Quarter Curriculum for Herdsmen. See page 344.

## REQUIREMENTS FOR ADMISSION TO NON-COLLEGIATE CURRICULA

Every applicant for admission to a non-collegiate curriculum must be at least seventeen years of age and must present a certificate signed by his county or high school superintendent showing that he has satisfactorily completed the eighth grade of the public schools or its equivalent. If the applicant has attended high school this certificate must also give his complete high school or academic record. This certificate should be filed with the Registrar as promptly as possible, and at least two weeks before the opening of the quarter. Formal application for admission must be filed by each applicant. Blank forms can be secured by writing to the Registrar.

Students applying for admission to the Creamery Operators' curriculum must present a statement signed by an employer or other responsible person showing at least three months of successful practical dairy experience.

These curricula are intended for the young man who is unable to enter the regular four-year curricula or who wants a short practical preparation for some special vocation.

**FEES AND EXPENSES.** See page 108.

**DEFINITION OF A CREDIT.** The value of each course is stated in quarter-credits. A credit requires one recitation (involving two hours of preparation), or one three-hour laboratory period or other combination of teacher contact and outside preparation involving a total of three clock hours per week for twelve weeks.

**COURSE NUMBERS.** In each department the courses, for convenience of reference, are given in numerical order. Non-collegiate courses are numbered from 1 to 99.



# AGRICULTURAL ENGINEERING

PROFESSOR DAVIDSON, Agricultural Engineering Laboratory, Room 112

## Description of Courses

69. **Dairy Machinery.** For Dairymen. Construction and operation of steam boilers and engines, gas engines, refrigerating machines, line-shafting, pulleys and belting; pipe fitting and soldering. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

70. **Management of Farm Equipment.** Design, selection and utilization of farm buildings; selection, operation and utilization of power and machinery units used in crop production and feed processing. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

# AGRICULTURE

## Curriculum for Creamery Operators

For entrance requirements, see page 342.

This twelve-months curriculum includes the manufacture of the various milk products and the handling of market milk. The laboratories in the dairy industry building are provided with the most modern equipment and the manufacturing work is conducted on a commercial basis.

The object of this curriculum is to fit the student for positions as butter, cheese, and ice cream makers, market milk operators or managers of dairy plants.

After completing the first two quarters' work each student is required to engage in practical dairy work in a commercial dairy plant at least five months before returning for the balance of the curriculum.

At the close of the fourth quarter, one week will be devoted to oral and written examinations over the technical dairy subjects. Those who successfully complete the prescribed curriculum with an average of at least 2 quality points per credit and satisfactorily pass the final examinations over the technical subjects will be granted a certificate.

Since this curriculum is planned as a unified sequence new students are admitted only at the beginning of the Fall Quarter.

First Quarter (Fall)		Second Quarter (Winter)	
	Credits		Credits
Dairy Practice		Dairy Practice	
D.I. 11	5	D.I. 12	4
Testing Milk and Milk Products		Buttermaking	
D.I. 15	3	D.I. 17	2
Buttermaking		Cheese Making	
D.I. 16	3	D.I. 29	4
Dairy Chemistry		Ice Cream Making	
Chem. 38	2	D.I. 20	3
Creamery Mathematics		Cattle Feeding and Management	
Math. 6	2	A.H. 31	2
Composition		Good Reading	
Engl. 6	3	Engl. 8	3
	<hr/> 18		<hr/> 18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102.

Third Quarter (Fall)		Fourth Quarter (Winter)	
Dairy Practice		Dairy Practice	
D.I. 13	2	D.I. 14	2
Factory Management		Market Milk	
D.I. 30	4	D.I. 21	3
Dairy Bacteriology		Condensed and Powdered Milk	
D.I. 54	3	D.I. 22	2
Dairy Machinery		Judging Dairy Products	
A.E. 69	3	D.I. 25	1
Creamery Accounting		Special Problems	
Ec. 24	2	D.I. 26	2
Breeding and Judging Dairy Cattle		Dairy Bacteriology	
A.H. 30	2	D.I. 55	3
Farm Crops Production		Creamery Accounting	
F.C. 1	3	Ec. 25	4
*Agr. 11	R		
	19		17

\*For Creamery Operators' Curriculum. Five months' experience will be required in a creamery or other dairy establishment between the second and third quarters of the curriculum

Curriculum for Herdsmen

Upon completion of this curriculum and one year of successful work with livestock, a statement will be granted showing completion of the curriculum.

The Herdsmen's Curriculum is a two-quarter curriculum designed to meet the needs of young men who are primarily interested in livestock. Opportunity is afforded the students for some specialization in the class of livestock in which they are most interested.

Instruction will be offered in two periods; the first from January to March 1938, the second from January to March the year following. The students are expected to spend the time between the two periods gaining additional experience in their chosen line.

This curriculum is most practical in nature and includes sufficient general work in agriculture to fit men for general livestock farming, dairy farming, herd management, or cow-testing association supervision.

FIRST QUARTER		SECOND QUARTER	
	Credits		Credits
Types of Livestock		Advanced Breed Studies	
A.H. 21	3	A.H. 22	4
General Livestock Feeding and Mgt.		Production and Feeding of Livestock	
A.H. 28	4	A.H. 20	3
Farm Crop Production		Mkt. Classes & Grades of Livestock	
F.C. 2	4	A.H. 29	2
Poultry Husbandry		Animal Breeding	
A.H. 40 or	2	A.H. 51	2
Farm Sanitation		Livestock Advertising	
Vet. 8		T.Jl. 25	2
Composition		Farm Management	
Engl. 6 or	3	Ec. 36	3
The Informational Article			
Engl. 7			16
Management of Farm Equipment			
A.E. 70 or	3	Suggested Electives	
Milk Testing		Farm Meats	
D.I. 27		A.H. 71	2
	19	Poultry Management	
		A.H. 40	2

### Description of Courses

3. For the Herdsmen's Curriculum, one year's successful work with livestock or as cow-test association supervisor will be required after the completion of the curriculum before a statement showing the completion of the curriculum will be granted.

11. For the Creamery Operator's Curriculum. Five months' experience will be required in a creamery or other dairy establishment between the second and third quarters of the curriculum.

## AGRONOMY

ASSISTANT PROFESSOR ELDREDGE, Agricultural Hall, Room 304

### Description of Courses

1. Farm Crop Production. Dairymen. Principles of crop production including choice of crops and varieties; selecting and purchasing seed; seedbed preparation, cultural operations, and harvesting. Fall. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3.

2. Farm Crop Production. Principles of crop production including choice of crops and varieties, selecting and purchasing seed, seedbed preparation, care during growth and harvesting. Brief study of soils, including maintenance of tilth, rotations, manuring, soil acidity, liming, and phosphates. Winter. Rec. 2. Rec. and lab. 2, 2 hr. Credit 4.

## ANIMAL HUSBANDRY

PROFESSOR W. F. LAGRANGE, Agricultural Hall, Room 105

Associate Professor Hansen; Assistant Professor Holbert

### Description of Courses

20. Production and Feeding of Livestock. Feeding of different classes of livestock for market production. Prerequisite: 28. Winter. Rec. 3. Credit 3.

21. Types and Market Classes of Livestock. Judging, types, carcasses, markets and market classification. Winter. Rec. and lab. 3, 2 hr. Credit 3.

22. Advanced Breed Studies. Judging, origin, development, characteristics, bloodlines, and families. Prerequisite: 21. Winter. Rec. 2. Rec. and lab. 2, 2 hr. Credit 4.

28. General Livestock Feeding and Management. Feed stuffs, compounding and balancing rations, practical care, feed and management of livestock. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

29. Market Classes and Grades of Livestock and Livestock Products. Classifying, grading, and valuing of cattle, sheep, hogs, horses, and livestock products. Prerequisite: 21. Winter. Rec. and lab. 3, 1 hr. Credit 2.

30. Breeding and Judging of Dairy Cattle. Principles and practices of selection and breeding of productive herds. Fall. Rec. 1. Rec. and lab. 1, 2 hr. Credit 2.

31. Dairy Cattle Feeding and Management. Winter. Rec. 2. Credit 2.

40. Poultry Management. Culling and selecting, housing, feeding, brooding, fattening, marketing of poultry, and grading of eggs. Rec. and lab. 2, 2 hr. Credit 2.

51. Animal Breeding. Principles of livestock breeding, selection and improvement of herds and flocks. Winter. Rec. 2. Credit 2.

71. Farm Meats. Killing, cutting and curing of farm meats. Prerequisite: 21. Lab. 2, 3 hr. Credit 2.

## CHEMISTRY

Chemistry Building, General Office, Room 202

PROFESSOR J. H. BUCHANAN

### Description of Courses

38. **Dairy Chemistry.** For Dairymen. Chemistry for the dairy and creamery. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

## DAIRY INDUSTRY

ASSOCIATE PROFESSOR E. F. Goss, Dairy Industry Building, Room 102B

Instructors Hostetler, TeSelle

### Description of Courses

11, 12, 13, 14. **Dairy Practice.** Buttermaking, cheesemaking, ice cream making, market milk, preparation of starters, testing milk and milk products and refrigeration plant operation. Special work in the last two quarters. (11) Fall. Lab. 5, 3 hr. Credit 5. (12) Winter. Lab. 4, 3 hr. Credit 4. (13) Fall. Lab. 2, 3 hr. Credit 2. (14) Winter. Lab. 2, 3 hr. Credit 2.

15. **Milk Testing.** Composition of milk. The Babcock test and various other tests employed in the dairy manufacturing plant. Fall. Rec. 3. Credit 3.

16, 17. **Buttermaking.** Quality of milk and cream, separation of milk, cream ripening, starters, churning, and preparing butter for market. (16) Fall. Rec. 3. Credit 3. (17) Winter. Rec. 2. Credit 2.

20. **Ice Cream and Ices.** Selection and preparation of materials, processing and merchandising of plain and fancy ice creams and related products. Winter. Rec. 3. Credit 3.

21. **Market Milk.** Methods used in the preparation of milk and cream for market. Winter. Rec. 3. Credit 3.

22. **Condensed and Powdered Milk.** Manufacture of condensed and powdered milk. Winter. Rec. 1. Lab. 1, 3 hr. Credit 2.

25. **Judging Dairy Products.** Milk, cream, butter, cheese, and frozen dairy products; special attention to score cards. Winter. Rec. 1. Credit 1.

26. **Special Problems.** A review of technical subject matter followed by an examination over all technical subjects. Winter. Rec. 2. Credit 2.

27. **Separation and Milk Testing.** For Herdsmen. Separation, care of milk and cream, and milk testing. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

29. **Cheesemaking.** Principles of cheesemaking and manufacture of soft cheese. Cheddar and other cured cheese, manufacture, curing, and marketing. Winter. Rec. 4. Credit 4.

30. **Factory Management.** Underlying principles of the management of creameries and other dairy plants. Fall. Rec. 4. Credit 4.

54, 55. **Dairy Bacteriology.** (54) Importance of bacteria in dairy products. Determination of numbers and types of bacteria in dairy products and their significance. Fall. (55) Continuation of 54. Winter. Rec. 1. Lab. 3, 2 hr. Credit 3 each course.

## ECONOMICS AND SOCIOLOGY

CHAS. M. ELKINTON, Agricultural Annex, Room 207

### Description of Courses

24, 25. **Creamery Accounting.** Bookkeeping methods and accounting procedure for country creameries. Fall, Winter, respectively. Fall. Lect. 1. Lab. 1, 3 hr. Credit 2. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4.

36. **Farm Management.** Principles. Farm records and their use. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

37. **Farm Management.** General principles of farm management. Farm accounting. Use of farm accounts in farm organization and operation. Winter, Rec. 3. Lab. 2, 3 hr. Credit 5.

46. **Marketing Agricultural Products.** Structure of markets, market practices, private and co-operative organization, government agency and regulation. Winter. Rec. 3. Credit 3.

## ENGLISH

PROFESSOR J. R. DERBY, Central Building, Room 18

Instructor Fleming

### Description of Courses

4. **Preparatory English.** A review of the fundamentals of grammar. Application of grammar to composition. Fall, Winter, Spring. Rec. 3. No credit.

5. **Remedial English.** Additional drill for students who have received a "condition" in English. Remedial work suited to the needs of individual students and offered by tutor in private conference. To be arranged.

6. **Composition, Oral and Written.** The practice of English; notetaking; writing of business letters. Fall, Winter. Rec. 3. Credit 3.

7. **The Informational Article.** Writing of such articles as the student may be asked to prepare for special occasion, and for publication. Winter. Rec. 3. Credit 3.

8. **Good Reading.** Training in how and what to read. Winter. Rec. 3. Credit 3.

## MATHEMATICS

ASSOCIATE PROFESSOR HERR, Central Building, Room 201

### Description of Courses

4. **Algebra Review.** A special course to which freshman students showing deficient preparation in mathematics are assigned by the Dean of the Junior College and the Dean of the Division. Fall, Winter. Rec. 5. Credit 5.

5. **Advanced Algebra.** Satisfies the requirements for the third half-unit of entrance algebra. Prerequisite: One year of high school algebra. Fall, Winter, Spring. Rec. 5. Credit 5.

6. **Creamery Mathematics.** Principles of mathematics needed in practical problems of dairy plant management. Fall. Rec. 2. Credit 2.

**TECHNICAL JOURNALISM**

**PROFESSOR BLAIR CONVERSE, Agricultural Annex, Room 102**

**Description of Course**

**25. Livestock Advertising.** For Herdsmen. Advertising as it relates to livestock selling. Second year. Rec. 2. Credit 2.

**VETERINARY MEDICINE****Description of Courses**

**3. Farm Sanitation and Communicable Diseases.** For Herdsmen. General consideration of the causes and spread of diseases; disinfectants and their application; general hygiene and stable sanitation. Winter. Rec. 2. Credit 2.

# School of Music

(Affiliated)

For Department of Music, see page 304.

Tolbert MacRae, Head of Department	Professor of Music
A. R. Edgar	Assistant Professor of Music
Rosalind Cook	Instructor of Piano
Ira Schroeder	Instructor of Piano
Ilza Niemack	Instructor of Violin
Howard Chase	Instructor of Piano and Organ

The purpose of the School of Music affiliated is to provide for the students' proper instruction in vocal and instrumental music and the opportunity of the cultural advantage in singing and playing in the different ensemble organizations which are under the direction of the members of the music faculty.

Students must register at Music Hall each quarter before they begin their lessons. Students who register late will not be charged for lessons missed because of late registration. All fees are payable at the Treasurer's Office before the registration is complete. Single lessons will be charged at the rate of \$2.00 and \$2.50.

## TUITION FOR EACH QUARTER FOR PRIVATE LESSONS

Voice—10 lessons per quarter	\$20.00
20 lessons per quarter	40.00
Piano—10 lessons per quarter	16.00
20 lessons per quarter	32.00
Piano—10 private lessons	for children under 12 years of age 12.00
with 10 lessons in class	
10 private lessons—for children under 15 years of age	12.00
Brass and Reed Instruments—10 lessons per quarter	16.00
20 lessons per quarter	32.00
Ensemble class of orchestra and band instruments, (1-hr. period, once a week) 10 to 15 in class, each	5.00
Harmony, ear training, sight reading, (1-hr. period twice a week) 10 to 15 in class, each	5.00
Violin—10 lessons per quarter	16.00
20 lessons per quarter	32.00
Organ—10 lessons per quarter	16.00
Piano practice, one hour each day for the quarter	3.00

## MUSICAL ORGANIZATIONS

The following musical organizations are maintained by the College: a men's Glee Club, women's Glee Club, Festival Chorus, Symphony Orchestra, and Concert Band. All of these societies give concerts during the year, and the Concert Band and Glee Clubs go on concert tours.

## MUSICAL ATTRACTIONS

Eminent artists and musical organizations are brought to the College each year. Among those who have appeared are the Minneapolis Symphony Orchestra (5), The United States Marine Band, Maud Powell, Julia Culp, the New York Symphony Orchestra, the late David Bispham, Evan Williams, Louise Homer (2), Mischa Elman (3), Anna Case (2), Josef Hoffman, the late Mme. Schumann-Heink (2), Mme. Gadschi, May Peterson, Casals, the Kneisel String Quartet, the Zoellner String Quartet, John McCormack (2), Rudolph Ganz, Frances Alda, John Philip Sousa and his band, Florence Hinkle, Arthur Middleton, Jan Kubelik, Riccardo Martin, Frances Ingram, Alberto Salvi (2), Maurice Dumesnil, Amelita Galli-Curci (3), Geraldine Farrar, Sergei Rachmaninoff, Fritz Kreisler, Louis Graveure (3), Emil Telmanyi, Irene Pavlovskaya, Forrest Lamont, Virgilio Lazarri, Tito Schipa, Tamaki Miura, San Carlos Grand Opera Co., Albert Spaulding, Paul Whiteman and Orchestra, Toti Dal Monte, Ignatz Friedman, The De Reszke Singers, Lambert Murphy, Merle Alcock, Marion Talley, Cyrena Van Gordon, London String Quartet, Russian Symphonic Choir, Jose Iturbi, Heinrich Schlusmus, Claire Dux, Kathryn Meisle, Walter Gieseking, John Charles Thomas, Don Cossack Male Chorus, Lily Pons, Jascha Heifetz, Saint Louis Symphony Orchestra, Lawrence Tibbett.



# The Summer Quarter, 1937

Charles E. Friley, President, Central Building.

James R. Sage, Registrar, Central Building.

C. B. Murray, Treasurer, Central Building.

John E. Foster, Dean, Agricultural Annex.

## GENERAL STATEMENT

The twenty-seventh Summer Quarter of Iowa State College will open June 15 and will close August 28, 1937. The college year is divided into four periods of eleven to twelve weeks each, designated as the Fall, Winter, Spring, and Summer Quarters. For the convenience of students, the Summer Quarter is divided into two terms. The first term will extend from June 15 to July 22; the second term from July 22 to August 28. Since each term stands as a unit, subjects taught during each term have twice as many class and laboratory periods per week as do the same subjects taught during the Fall, Winter, and Spring Quarters. Therefore the student carries, in each term of the Summer Quarter, only one-half the normal number of subjects that he carries in the other quarters.

## SUMMER QUARTER CATALOGUE

For details regarding any phase of the Summer Quarter please consult the Summer Quarter Catalogue, copies of which will be mailed on request. Inquiries should be addressed to the Dean of the Summer Quarter, Iowa State College, Ames, Iowa.

## SPECIAL BULLETINS

Summer Quarter bulletins on agriculture, botany, home economics, mathematics, psychology, and vocational education will be mailed upon request. Address the Dean of the Summer Quarter.

## CORRESPONDENCE WITH DEPARTMENT HEADS

Prospective students desiring special information regarding any curriculum or course are urged to correspond with the head of the department concerned.

## THE FACULTY

The instruction in the Summer Quarter will be given by a corps of about 200 teachers, nearly all of whom belong to the regular staff. The subjects taught in the Summer Quarter will be given by the same specialists that teach them in the other quarters of the college year. Practically all of the heads of the departments and most members of the instructing staff of professorial rank are in residence during one or both of the summer terms. The opportunities for contact with leading educators in their respective fields are fully as great during the Summer Quarter as during the remainder of the year.

## OPPORTUNITIES FOR UNDERGRADUATE STUDY

Undergraduate work is offered during the Summer Quarter in most of the departments of Iowa State College. The opportunity to secure such work should appeal to men and women of the following groups:

**REGULAR STUDENTS.** Students in residence during other quarters of the college year who have become irregular for any reason, may find it advantageous to attend the Summer Quarter. New students who wish to receive their degrees as early as possible may shorten the time by study in summer quarters as well as during the regular academic year.

Students who plan to teach will find the Summer Quarter an excellent opportunity to secure professional training in psychology and in vocational education.

**TEACHERS** who have not completed college curricula leading to the bachelor's degree and who are particularly interested in agricultural education, home economics education, or education in industrial arts, and in the related sciences and technical subjects will be able to advance toward such degrees.

**ANY MATURE INDIVIDUAL** who satisfies the department concerned as to his ability to carry the work desired will be admitted without meeting the usual entrance requirements.

## OPPORTUNITIES FOR GRADUATE STUDY

That the Graduate College has become an important element in the make-up of Iowa State College is evidenced by the fact that during the academic year 1935-36, 530 graduate students were enrolled. They came from scores of colleges and universities, not only of the United States, but of the world. During the first and second terms of the 1936 Summer Quarter 589 graduate students were enrolled.

It is the primary purpose of the Graduate College to give opportunity to carry into the graduate field the work of the various technical and scientific departments of the institution, and to encourage and foster research.

The Summer Quarter offers an exceptional opportunity to the qualified student who plans to pursue graduate work at Iowa State College. Practically all departments of the institution offering major subjects

retain in residence during one or both terms of the Summer Quarter, teachers particularly qualified to direct graduate study in their respective fields. In many subjects the Summer Quarter is the most satisfactory for graduate work. The entire laboratory, library, and instructional facilities are at the disposal of those who can profit by graduate work in the technical and related scientific fields.

An increasingly large proportion of the Summer Quarter students have been those who already have a baccalaureate degree and are interested in advanced or graduate work. Among those who find exceptional opportunity to advance themselves toward masters' or doctors' degrees are the following:

**TEACHERS AND SUPERVISORS** of agriculture, home economics, manual training, and industrial arts in the public schools, particularly high schools and consolidated schools, may pursue advanced courses relating to their particular fields. Those who are graduates in technical courses will usually be interested in securing advanced degrees by pursuing major work in certain departments in agriculture, engineering, home economics, etc., with minor work in vocational education, agricultural education, home economics education, or industrial arts; or by carrying major work in one of these special educational fields, with minor work in a chosen technical department.

**SUPERINTENDENTS, PRINCIPALS, AND SUPERVISORS.** The Summer Quarter is serving a most useful end in acquainting superintendents, principals, and supervisors with the recent phases of agriculture, home economics, and industrial arts, and in affording an opportunity for specialized instruction in vocational education.

**TEACHERS OF THE SCIENCES.** Excellent opportunities will be offered those who wish to pursue advanced courses in the biological sciences and in mathematics, physics, and chemistry.

**REGULAR GRADUATE STUDENTS.** Many of the graduate students of the regular college year find conditions during the Summer Quarter particularly advantageous for continuing their graduate work. Many research problems can be handled most satisfactorily during this period.

## REQUIREMENTS FOR ADMISSION

The entrance requirements for the Summer Quarter do not differ from those for the other quarters of the college year. See page 99.

## CREDITS

Work completed in the Summer Quarter receives proportionate college credit on the same basis as during the other quarters of the college year. For graduate students classification in courses carrying full graduate credit is limited to a maximum of eight credits per term. For undergraduates eight or nine credits per term constitute full work; the maximum number of credits for which any student may register during either term is ten, and then only upon previous demonstration of exceptional ability.

## RESIDENCE REQUIREMENT

Attendance upon five six-weeks summer terms is considered as meeting the residence requirement of one year in determining eligibility to the degree of Master of Science.

## REGISTRATION FEE

For each term of the Summer Quarter the registration fee will be as follows:

Graduate College . . . . .	\$26.00
Graduate College, Staff Members . . . . .	9.00
Division of Agriculture . . . . .	26.00
Department of Agricultural Engineering . . . . .	27.00
Division of Engineering . . . . .	28.00
Division of Home Economics . . . . .	26.00
Division of Industrial Science . . . . .	26.00
Division of Veterinary Medicine . . . . .	28.00

The fee per credit hour for less than full time is as follows: engineering, veterinary medicine, each \$5.50; agricultural engineering, home economics, industrial science, graduate college, each \$5.50; agriculture, \$4.50. The minimum charge is \$8.00.

The above registration fee is a general fee covering all miscellaneous charges such as laboratory fees, hospital fees, admission to the College entertainment series, etc.

## MATRICULATION FEE

Each new student must pay a matriculation fee of \$10.00. This fee is paid but once.

## TUITION

All students who are non-residents of Iowa, except those in the Graduate College, will pay a tuition fee of \$7 each term of the Summer Quarter in addition to the Registration fee.

## BOARD AND ROOMS FOR WOMEN

Women will arrange for rooms through the office of the Director of Residence. Undergraduate women students will be assigned to college dormitories. One dormitory will be reserved for graduate and mature students, but such students, if they so desire, may arrange for accommodations other than those provided in the dormitories.

Meals will not be served in the hall dining room during the Summer Quarter. Cafeteria service and dining room service are available at reasonable prices in the Memorial Union, which is situated on the main campus and near the residence halls. The price of rooms for each

term is \$16 per person, two in a room; \$16 to \$30 for a single room. A deposit of \$5 is required to reserve a room. Students should bring pillows, sheets, pillow cases, blankets, and spread.

### **BOARD AND ROOMS FOR MEN**

Rooms for men will be available in private homes. The Secretary of the Y. M. C. A., Alumni Hall has a list of approved rooms in private homes and rooming houses. The cafeteria in Memorial Union will be open during the entire Summer Quarter.

### **EXPENSES**

Total expenses will vary with the individual. For each half of the Summer Quarter, the fixed expenses consisting of room, board, and the registration fee need not exceed \$70 to \$75 for either men or women. The foregoing does not include books.

### **STUDENT HEALTH SERVICE**

The college hospital and dispensary will be open throughout the first term of the Summer Quarter; during the second term dispensary service is available. The privileges of the hospital and dispensary are extended to all students who pay the full registration fee.

### **SOCIAL LIFE AND RECREATION**

Social gatherings of students and faculty, picnics, and informal dances will be arranged. The Y. M. C. A. and Y. W. C. A. will sponsor "Mixers" each term. A choral society made up of students and faculty members will be organized the first term under the direction of Professor Tolbert MacRae. Those interested in tennis, baseball, track, or indoor gymnasium work will find ample facilities for these activities. The swimming pool in the men's gymnasium will be open each day.

### **CONVOCATIONS FOR CONFERRING DEGREES**

At the close of each term of the Summer Quarter a convocation will be held for the purpose of conferring degrees.

### **SUMMER QUARTER NEWS**

The Summer Quarter News is an official weekly publication of the College. Copies may be obtained gratis each Thursday at the following places: Summer Quarter Office, Room 203, Agricultural Annex; Campus Book Store; Memorial Union; Registrar's Office, 107 Central Building.

# Short Courses

R. M. VIEQUAIN, Chairman

Short courses held at Iowa State College last year attracted a total of 9,697 adults and young people, 850 more attendants than during the previous year. Five new short courses, Refrigerated Cold Storage Locker Operators, Highway Safety, Poultry and Chicken Show, and Air Conditioning were held. Yearly an increasing number of groups finds worth-while the round-table discussions and educational meetings in the fields of agriculture, home economics, and engineering.

Anyone concerned with the problems or interested in information presented at the meetings is invited to attend. Iowa State short courses are conducted for two major purposes: First, to provide opportunity for men and women of the same profession, trade, or business to meet and discuss their mutual problems; and, second, to enable the individuals to discuss and study their problems with college specialists in the light of most recent research findings. Each course, naturally, is limited in scope and time and deals directly and practically with the field indicated. The exact dates for each short course are usually not set until two or three months prior to holding the course.

The short course bulletin illustrating and giving a descriptive write-up of each course is printed October 15th each year. A copy may be had upon request.

## CHRONOLOGICAL LIST OF SHORT COURSES

### 1936

Solid Fuel Conference . . . . .	Sept. 9-11
Electric Metering . . . . .	Oct. 8-10
Refrigerated Cold Storage Locker Operators . . . . .	Oct. 8-9
Sewage Treatment . . . . .	Nov. 10-12
Garden Club . . . . .	Nov. 11-13
Midwest Gas School and Conference . . . . .	Nov. 18-21
Beekeepers . . . . .	Nov. 11-13
Fruit Growers . . . . .	Nov. 11-12
Poultry Breeders . . . . .	Dec. 7-8
4-H Boys . . . . .	Dec. 28-30

### 1937

Farm and Home Week . . . . .	Feb. 8-13
Parent Education . . . . .	Feb. 11, 12
Dairy Industry Week . . . . .	Feb. 15-19

Greenkeepers . . . . .	March 1, 2
Commercial Florist . . . . .	March 4, 5
Welding . . . . .	March 24-26
Surveyors . . . . .	March 26, 27
Heating and Air Conditioning . . . . .	April 7-9
Soil Management . . . . .	May 4, 5
High School Agricultural Congress . . . . .	May 13, 14
Firemen . . . . .	May 25-28
Livestock Judging Conference . . . . .	June 16-18
Country Life Institute . . . . .	June 21-25
State Conference of Voc. Ag. Instructors . . . . .	June 16-19
4-H Girls . . . . .	June 16-19
Custodians of Public Buildings and Grounds . . . . .	June 21-25
Poultry and Egg Marketing . . . . .	June
Farm Tours . . . . .	June and September
Cattle Feeders . . . . .	June
Seedsmen . . . . .	June 16
Hatcherymen . . . . .	August or September

### COMMITTEE IN CHARGE

D. C. Faber, Director of Engineering Extension, and in charge of Engineering short course.

E. F. Goss, Associate Professor of Dairy Industry.

P. C. Taff, Assistant Director of Agricultural Extension.

A. L. Bakke, Professor Plant Physiology.

A. B. Caine, Professor of Animal Husbandry.

Henry Giese, Professor of Agricultural Engineering.

Mrs. Zenobia Ness, Chairman of Home Economics Short Course.

A. L. Anderson, Associate Professor of Animal Husbandry.

H. D. Hughes, Professor and Chief of Farm Crops.

Don Dilworth, Technical Journalism.

R. M. Vifquain, Personnel Officer, Agricultural Division, Chairman.

For information regarding dates, programs, etc., write R. M. Vifquain, Iowa State College, Room 122N Agricultural Hall, Ames, Iowa.

# Experiment Stations

## AGRICULTURAL EXPERIMENT STATION

R. E. BUCHANAN, Director

Investigations relating to agriculture were begun practically with the opening of Iowa State College in 1869. The passage of the Hatch Act by the Federal Congress in 1887 led to the prompt acceptance of the provisions by the State of Iowa and the establishment and recognition of the Iowa Agricultural Experiment Station as an integral part of the College. The statement of functions is formulated in the Hatch Act as follows:

"In order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigations and experiment respecting the principles and applications of agricultural science . . . Sec. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals, the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under the varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test the comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States and Territories."

The Federal Adams Act of 1906 increased the funds available for the Experiment Station, at the same time limiting somewhat more narrowly the utilization of the Adams funds, stating that they

"Shall be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States."

The federal Purnell Act of 1925 again increased the federal aid available. The statement reads:

"The funds appropriated pursuant to this act shall be applied only to paying the necessary expenses of conducting investigations or making experiments bearing directly on the production, manufacture, preparation, use, distribution and marketing of agricultural products



and including such scientific researches as have for their purpose the establishment and maintenance of a permanent and efficient agricultural industry, and such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life, and for printing and disseminating the results of said researches.'

The most recent act to increase the facilities of the Agricultural Experiment Station is the Bankhead-Jones Act of 1935; this provides:

"For research into basic laws and principles relating to agriculture."

The Secretary of Agriculture is also authorized and directed to "encourage research into laws and principles underlying basic problems of agriculture in its broadest aspect; research relating to the improvement of the quality of, and the development of new and improved methods of production of, distribution of, and new and extended uses and markets for, agricultural commodities and by-products and manufactures thereof; and research relating to the conservation, development, and use of land and water resources for agricultural purposes."

The State of Iowa through legislative appropriations has supplemented the federal grants, and has supplied land, buildings and equipment for carrying on the research program adequately.

**FUNCTIONS OF THE STATION.** It is the definite function of the Iowa Agricultural Experiment Station to utilize all of the facilities and techniques developed by the arts and sciences in the solution of the problems relating primarily to agriculture and rural life. Specifically it must:

1. Increase knowledge concerning the best practices of agriculture in order that the information may be used by the Agricultural Extension Service and other agencies for dissemination to all who may be interested.
2. Increase knowledge basic to the proper teaching of agriculture and the related sciences in schools and colleges.
3. Contribute to the development of fundamental research in agriculture and in the arts and sciences basic to it.

**ORGANIZATION.** The Iowa Agricultural Experiment Station is organized into three Offices having executive or administrative responsibilities relating to all phases of the work of the Station, and fourteen Sections, which are entrusted with the research in special fields. The Sections in the Agricultural Experiment Station are analogous to the Departments in the College. In several instances Sections are subdivided into Subsections corresponding to collegiate subdepartments. Institutes are composed of the staffs of sections who are working on the various phases of some complex problems. For example, the Iowa Corn Research Institute includes all members of the staff who in a research or executive capacity have to do with corn (maize) investigations. The Offices, Sections, Subsections and Institutes at present recognized are:

#### A. OFFICES

1. Office of the Director
2. Office of the Vice Director
3. Office of the Bulletin Editor

**B. SECTIONS AND SUBSECTIONS**

1. Agricultural Engineering Section
2. Agronomy Section
  - a. Farm Crops Subsection
  - b. Soils Subsection
3. Animal Husbandry Section
  - a. Animal Breeding Subsection
  - b. Animal Chemistry and Nutrition Subsection (jointly administered, see also Chemistry Section)
  - c. Animal Production Subsection
  - d. Dairy Husbandry Subsection
  - e. Meats Subsection
  - f. Poultry Husbandry Subsection
4. Bacteriology Section
5. Botany and Plant Pathology Section
6. Chemistry Section
  - a. Animal Chemistry and Nutrition Subsection (jointly administered, see also Animal Husbandry Section.)
  - b. Plant Chemistry Subsection
7. Dairy Industry Section
8. Entomology and Economic Zoology Section
9. Forestry Section
10. Genetics Section
11. Home Economics Section
  - a. Foods and Nutrition Subsection
  - b. Household Equipment Subsection
  - c. Textiles and Clothing Subsection
12. Horticulture Section
  - a. Floriculture Subsection
  - b. Pomology Subsection
  - c. Vegetable Crops Subsection
13. Rural Social Science Section
  - a. Agricultural Economics Subsection
  - b. Rural Sociology Subsection
  - c. Rural Education Subsection
14. Statistical Section

**C. INSTITUTES**

1. Iowa Corn Research Institute. For details see special publication of the Iowa Agricultural Experiment Station entitled "Organization of the Iowa Corn Research Institute."

**FACILITIES:** Many of the laboratories, greenhouses, etc. for carrying on research in Agriculture and Home Economics are housed in buildings on the main campus of Iowa State College.

Land areas owned or leased by the College and used by the Agricultural Experiment Station contain about 1774 acres. The principal uses are as follows:

**ANIMAL PRODUCTION FARM.** A tract of 180 acres is used for research on nutrition and breeding of swine, sheep and beef cattle. The farm is equipped with two houses, horse barn, clay block tile storage and feed barn, cattle feeding sheds, a large number of individual

hog houses and a hog barn used for swine performance record investigations.

**DAIRY HUSBANDRY FARM.** An experimental barn and laboratory maintained on the 216 acre farm of the Dairy Husbandry Department is used by the Subsection for investigations in the feeding, breeding and management of dairy cows. An additional tract of approximately 92 acres located on the Walker Farm is also available for these investigations.

**POULTRY HUSBANDRY FARM.** A tract of about 35 acres is used jointly by the Department and Section of Poultry Husbandry for studies on nutrition and breeding of poultry. The equipment on the farm includes a clay-block poultry house, a two-story brick laboratory building, poultry houses of various types, a barn and a residence. Foundations for a new brooder house have been laid. This is a one-story building, 30 feet by 136 feet, with a two-story feed and equipment storage unit in the center.

**HORTICULTURAL FARM.** An area of 165 acres is used jointly by the Department and Section of Horticulture for studies on truck crops, fruits and flowers. The farm is equipped with two residences, a large barn, a two-story brick seed house, machinery sheds and modern storage cellars.

**SOIL EROSION EXPERIMENTAL NURSERY.** An 82-acre tract is used for the study of the propagation of plants, particularly useful in erosion control. A portion of this area, namely 32 acres, is on leased land; 17 acres on the Walker farm and 15 acres on the Allen farm. The Erosion Nursery is equipped with a modern storage cellar and two storage buildings.

**ARBORETUM.** Eighty acres adjoining the Horticulture Farm and the Erosion Nursery have been set aside for an arboretum. There are no buildings on this tract but rapid progress has been made in installing bridges, building dams and planting shrubs and trees. The arboretum is administered by an all-college committee.

**HERBACEOUS GARDEN.** A 5-acre tract of land adjoining the arboretum on the north has been provided for a grass and herbaceous garden. This area is devoted to the growth and production of a large number of grasses and herbaceous plants of special interest from the standpoint of erosion control and other phases of Iowa agriculture.

**AGRONOMY FARM.** This area of 240 acres is used for investigations on soils, fertilizers, crop rotations, testing of field crops and crop breeding. Forty acres of this area were added to the Agronomy Farm in the fall of 1935. The farm has a residence, horse barn, a storage barn, machinery shed, corn crib and a two-story tile block seed storage building equipped with a corn drying plant.

**AGRICULTURAL ENGINEERING FARM.** This comprises 235 acres of which 75 acres are leased; 40 acres on the Akin farm and 35 acres on the Allen Farm. The farm is devoted to studies on methods of seed bed preparation, cultivation, harvesting and storage of field crops. The farm is equipped with a residence, a barn, corn crib, a machinery shed and small laboratory building.

**APIARY.** An area of 10 acres adjoining and merging with the arboretum is used for studies on bees. A laboratory and storage building are located on this area.

**GENETICS AND BOTANY FARM.** A tract of 20 acres east of the Poultry Farm is used jointly by the Genetics and Botany Sections for studies in plant genetics, plant physiology, and plant pathology. A storage building is located on the farm.

**PAGE COUNTY SOIL EROSION FARM.** This 200-acre farm is devoted to erosion control studies. The farm is equipped with a residence, a two-story brick laboratory building, a steel corn crib, a barn, and a machinery shed.

**TEMPLETON FARM.** A tract of 148 acres of land adjoining the Veterinary and Animal Production Farms is used in part by the Agricultural Experiment Station. About 75 acres have been assigned to the Animal Production Subsection and about 5 acres to the Farm Crops Subsection for hybrid corn production. This farm is equipped with a residence and barn.

**WALKER FARM.** This farm of 110 acres lying west of the Dairy Husbandry Farm has been leased. Ninety-two acres of this area have been assigned to the Dairy Husbandry Subsection; the balance is used by the Soil Conservation Nursery.

**COLLEGE FIELD.** Twenty-one acres north of the Veterinary buildings were used during the year by the Farm Crops Subsection and the Botany and Plant Pathology Section for field studies.

**CHARLES CITY FARM.** The Horticulture Section has a limited number of investigations under way on a 17-acre tract located at Charles City. These investigations are gradually being brought to a close.

**FOREST NURSERY.** A 10-acre tract just north of the Erosion Nursery is used by the Forestry Section. This tract is equipped with overhead irrigation and is used for experimental work with forest trees in connection with the Clark-McNary grant.

**WORK OF STATION.** The work of the various sections is organized under specific projects. During the year 1936-37 there are 340 distinct approved projects. The results of these studies are published either as station bulletins, or as articles in the technical and scientific press. During 1935-36 seventeen popular bulletins were issued, seventeen research bulletins, one annual report, two special reports, and six miscellaneous publications. Ninety-four articles were approved for publication in scientific and technical journals.

## ENGINEERING EXPERIMENT STATION

T. R. Agg, Director

The Iowa Engineering Experiment Station at Iowa State College was organized in 1904 for the purpose of providing organized research of the character needed to foster and develop the industries of the state.

In the period since its organization the Station has confined itself largely to research projects intended to encourage the utilization of the undeveloped raw materials of the state and to investigations seeking to solve some of the pressing problems relating to sanitation, construction of highways, drainage, purification of industrial wastes, and other like subjects of importance to the health and prosperity of the state.

The primary emphasis has been placed upon types of problems encountered by manufacturing and engineering industries of Iowa, since it is in this particular field that the Station is best qualified to serve. In addition, a considerable number of researches have been undertaken for the industries related to agriculture with a view to developing solutions to some of the engineering problems that have been encountered.

The growth of the cities and towns of the state and the desire on the part of their citizens for clean, comfortable, and sanitary surroundings have given rise to a number of problems that have puzzled their responsible officials. Some of these relate to the materials and methods employed in pavements, some arise out of the desire to eliminate stream pollution and to dispose of the sewage of the city in an inoffensive manner, and some arise out of the operation of the various utilities such as those furnishing water, gas, and electricity. The Station has made progress in developing the facts and principles needed to solve problems of this type.

The principal lines of research in which the Engineering Experiment Station is engaged are the following:

In the disposal of the waste from some types of industrial establishments there is a problem of sewage disposal for which there has been no satisfactory solution, and several projects are now in progress with a view to developing adequate methods of handling industrial wastes, including that from small creameries and canneries.

Portland cement concrete is used in increasing quantities each year for construction of public works and for privately owned buildings, manufacturing plants, and on the farm. The Station is constantly studying the problem of improving the quality and decreasing the cost of concrete for these various purposes.

Since the organization of the Iowa Highway Commission and the consequent rapid expansion of road improvement, there has been a need for the determination of many economic and engineering facts with reference to the building of highways. The projects in this field are organized with a view to supplementing the investigations carried on by the Iowa Highway Commission and particularly to developing the fundamental or basic data needed to establish broad principles of control.

Each year many miles of underground conduits are laid. These are used for conveying water, sewage, or gases. There have been a great many failures of sewer pipe due to errors in estimating the loads such pipes would be required to carry. A long series of researches in this field is nearing completion and many questions arising in the design of these conduits will be answered by the results of these investigations.

The necessity for developing a means of utilizing agricultural wastes in order to supplement other efforts to make agriculture profitable has resulted in a long series of researches which have been exceedingly fruitful. Means have been found for manufacturing artificial lumber, paper, and a number of industrial products from soy beans and such waste materials as straw, cornstalks, oat hulls, and the like.

## INDUSTRIAL SCIENCE RESEARCH

CHARLES E. FRILEY, Director

The Division of Industrial Science, through its scientific staff and in co-operation with other research organizations of the College, sponsors a comprehensive program of research in the natural sciences. The primary purpose of the program is to aid in the solution of the agricultural and industrial problems of Iowa through the application to these problems of the principles, the techniques, and the improved processes worked out in the Departments of Bacteriology, Botany, Chemistry, Geology, Mathematics, Physics, Psychology, and Zoology. The research work is co-ordinated with that of the Agricultural Experiment Station, the Engineering Experiment Station, and the Veterinary Research Institute.

## STATISTICAL LABORATORY

GEORGE W. SNEDECOR, Director

The purpose of the Statistical Laboratory is to promote and foster the advantageous use of statistics in the teaching and researches of the College.

**RESEARCH.** The staff of the Laboratory, together with other interested members of the College staff, seek to develop practical and efficient methods of applying statistical theory to the problems that arise in practice. The results are published in such form as to make them readily available to the layman.

**STATISTICAL COUNSEL.** Professional advice in statistical methods is made available to students and members of the College staff. This is directed (a) toward the design of experiments whose results shall be capable of convenient and valid statistical treatment and (b) to the selection of the best available methods for the reduction of data already collected.

**TEACHING.** While the Statistical Laboratory is not a department of instruction, members of its staff devote part of their time to teaching statistics in the Mathematics Department. Other members of the College staff teach courses in statistics in the Department of Economics and Sociology. Still others teach courses whose objectives include specialized application of statistics. One function of the Laboratory is to correlate these activities, to promote interest in statistical scholarship and instruction, to prevent duplication of effort, and to assist in organizing such courses in statistics as may be needed in the College.

**COMPUTATION SERVICE.** The Laboratory furnishes such computation as may be required by persons in the College. This computation may be done in one of the regular computing rooms, or, in special cases, in other convenient locations. The equipment in the Laboratory includes a complete set of machines for sorting and tabulating punched cards.

**CALCULATING MACHINES.** It is the policy of the College to supply necessary computing machines for all who need them. The Laboratory is responsible for the installation and maintenance of such machines as

may be required at various stations in the College buildings. Additional machines are available to those who can arrange to use them in the regular computing rooms.

## VETERINARY RESEARCH

CHARLES MURRAY, Director

This department is supported by special appropriation of the legislature and is housed in a laboratory building on the Veterinary Research Farm, one mile south of the campus. In addition to the laboratory, there are buildings especially equipped for housing animals used in experimental work. There are but few animal diseases entirely understood, and many but partially understood. It is the object of this department to investigate such diseases with the view of working out methods by which they can be controlled or eradicated. Thus the work of the department supports the educational work and assists in keeping instruction modern.

# Extension

## EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS

R. K. BLISS, Director

Extension teaching is recognized as a function of the College, along with resident teaching and research. It was established as a branch of the College by an Act of the Thirty-first General Assembly which became a law on April 10, 1906. Since that time this work has been developed to carry information on every important subject relating to agriculture and rural life from the College to the people.

Extension work is financed jointly by the State of Iowa and the United States Department of Agriculture. Also under a state statute a working relationship is maintained with the county farm bureaus which foster through their programs the same type of educational projects offered by the Extension Service.

In order to accomplish the purposes of the Extension Service a staff of workers representing each department of the Divisions of Agriculture and Home Economics and certain phases of the Divisions of Veterinary Medicine, Industrial Science, and Engineering, is maintained at the College. These workers are available to the people of the state for lectures, demonstrations, consultations, and conferences.

In order to effectively reach the entire state the laws of Iowa provide for an organization of farmers and farm owners in each county now known as the County Farm Bureau. They provide for co-operation between these county farm bureaus, the Iowa State College, and the United States Department of Agriculture. These agencies jointly employ county agents, home demonstration agents, and emergency agents when needed. Educational programs are developed and carried out co-operatively.

The scope of services available to the people of the state is indicated in the following list of projects offered in 1936:

### SOILS AND CROPS PROJECTS

#### Sub-Group: Soils

- Soil Survey Follow-up and Land Use Planning, Meetings and Demonstrations
- Soil Management to Maintain Soil Fertility and Reduce Crop Costs
- Soil Erosion Control

#### Sub-Group: Farm Crops

- Corn Improvement Demonstrations
- Increasing Legume and Forage Crops
- Small Grain and Flax Improvement
- Pasture Improvement and Renovation



**Sub-Group: Horticulture**

Fruit Growing Demonstrations  
Farm Orchard and Small Fruit Planting Demonstrations  
Home Gardening and Small Fruit Growing  
Vegetable Crops Demonstrations  
Commercial Greenhouse Management  
Ornamental Gardening

**Sub-Group: Forestry**

Shelterbelt Tree Planting Demonstrations  
Erosion Tree Planting Demonstrations  
Reforestation, Woodlot and Woodland Management

**Sub-Group: Insect and Rodent Control**

Field Crop Insect Control  
Control of Orchard, Garden and Truck Crop Insects  
Training School in Household and Garden Insect Control  
Rodent Control  
Livestock Insect Control

**Sub-Group: Plant Diseases and Botany**

Controlling Field Crop Diseases  
Controlling Fruit and Vegetable Diseases  
Controlling and Eradicating Weeds  
Seed Analysis and Use of Good Seed  
Preservation, Protection and Appreciation of Plants

**LIVESTOCK PROJECTS****Sub-Group: Animal Husbandry**

Swine Improvement Demonstrations  
Beef Cattle Programs  
Home Butchering and Use of Meat Demonstrations  
Lamb and Wool Improvement Demonstrations  
Horse Management and Use Demonstrations

**Sub-Group: Dairy Husbandry**

Cow Testing Associations  
Dairy Feeding and Management Schools  
Dairy Cattle Breeding and Management

**Sub-Group: Dairy Industries**

Educational Butter Scoring  
Milk and Cream Scoring  
Dairy Products Quality Demonstrations

**Sub-Group: Poultry**

Quality Egg Production Demonstrations  
Poultry Management and Record Demonstrations  
Flock Breeding and Management Demonstrations  
Turkey Production Demonstrations  
Poultry Meetings and Demonstrations

**Sub-Group: Veterinary**

Animal Health  
Swine Sanitation and Vaccination Schools  
Poultry Sanitation and Tuberculosis Control  
Horse Parasite Control

**AGRICULTURAL ECONOMICS PROJECTS****Sub-Group: Farm Management**

Farm Business Management and Organization  
Agricultural Outlook and Economic Conferences

**Sub-Group: Land Economics****Sub-Group: Farm Finance**

**Sub-Group: Marketing**

Basic Marketing and Economic Principles  
Market Analysis and Market Practices  
Membership and Organization Set-up of Co-operative Organizations  
Accounting and Business Practices of Co-operative Organizations  
Poultry and Egg Marketing and Grading Demonstrations  
County Study Groups in Livestock Marketing

**Sub-Group: Rural Organization and Community Development**

Home and Community Activities  
Rural Organization Service

## FOODS AND NUTRITION PROJECTS

Fundamental Food Needs of the Body  
Meals Adapted to Different Ages and Occasions  
Raising Standards Through Better Food Management  
Making the Best Use of Home Produced Foods  
Improvement in Quality of the Farm Food Supply

## CLOTHING PROJECTS

Being Well Dressed  
Clothing the Family  
Personality in the Complete Costume

## HOME FURNISHING PROJECTS

Fundamental Principles in Home Furnishings  
Color and Design in Selection of Furnishings  
Thrift in Home Furnishing  
Weaving and Refinishing  
Commodity Study of Textiles  
Loom Weaving

## HOME MANAGEMENT PROJECTS

How Efficient Practices, Sanitary Measures and Money Planning Contribute to the Successful Home  
How the Well Planned Home Creates Leisure Time  
How the Business Side of Home Making Contributes to the Mutual Understanding and Happiness of the Family

## CHILD DEVELOPMENT AND FAMILY RELATIONSHIP

Growth and Health  
Habits and Character  
Interests and Education  
Youth and Family Relationships

## BOYS AND GIRLS 4-H CLUB WORK

Livestock Projects:  
Baby Beef Club  
Purebred Beef Heifer Club  
First Year Dairy Calf Club  
Second Year Dairy Calf Club  
Third Year Dairy Calf Club  
Market Pig Club  
Market Litter Club

Purebred Sow and Litter Club  
4-H Sheep Club  
Grade Flock Sheep Clubs  
Colt Club  
Beginners' Poultry Club  
Grow Healthy Chick Club  
Winter Egg Layers Club  
Poultry and Egg Marketing Club

**Crops Projects:**

Corn Club  
4-H Legume Clubs  
Garden and Fruit Clubs  
Forestry Club Demonstrations

**Miscellaneous Projects:**

Farm Record Club Demonstrations  
Honey Production Club

**Home Projects:**

Canning Clubs  
Bread Clubs  
Clothing Clubs  
Home Furnishing Clubs  
Home Efficiency Clubs

## SUPPLEMENTARY

**Agricultural Engineering:**

Soil Erosion Control  
Farm Builders' School  
Demonstration on Reducing Power and Machinery Costs  
Farm Structures and Farm Utilities

**Landscape Architecture:**

Farmstead Development  
Home Grounds Improvement Training Schools  
Home Grounds Development  
Community Planning Meetings and Demonstrations  
Rural School Grounds Improvement

**Beekeeping:**

Honey Production Demonstrations  
Eradication of Bee Diseases

**Agricultural Education**

**Wildlife Conservation**

**Rural Young People's Organization**

Owing to the close relationship with the federal government, the Extension service is given a prominent part in carrying out emergency programs relating to agriculture. To date, the wheat and soil conservation and domestic allotment programs have been announced or completed and those dealing with other commodities will be announced. The Extension Service interests itself primarily in the organization and educational phases of these programs.

For definite information regarding service available write Extension Service, Iowa State College.

## ENGINEERING EXTENSION

D. C. FABER, Director

The thirty-fifth General Assembly provided an appropriation for the establishing of Engineering Extension work at Iowa State College.

As a department of general extension work, engineering extension is co-ordinate with agricultural extension and bears the same relation to the Division of Engineering that agricultural extension does to the Division of Agriculture. The Engineering Extension has its own instructional force, the members of which are members of the engineering faculty, co-operating closely with the Division of Engineering and the Engineering Experiment Station.

## INDUSTRIAL SHORT COURSES

In co-operation with educational, trade, and industrial organizations, Engineering Extension conducts short courses of instruction at the College and at various points throughout the state. These courses vary in length from one day to a week, depending upon the nature of the work. The instruction in these courses is intensely practical and consists of lectures, demonstrations, and laboratory work.

During the past year courses were conducted for telephone operators, custodians and janitors, firemen, welders, gas men, surveyors, and sewage treatment plant operators.

## EXTENSION CLASSES AND CORRESPONDENCE STUDY

Extension classes are conducted in industrial centers where a sufficient number of persons are interested in one subject to make such an arrangement possible. These classes meet once or twice a week for a period of two to six months depending upon the length of the course. This work does not duplicate the work of the public night schools in any way. Extension classes are usually given in co-operation with the local Boards of Education or other recognized educational agencies.

Courses in Foremanship are offered in extension classes to groups of foremen and others in executive positions in industry. These courses deal entirely with the problems of the foreman as supervisor, manager, and instructor. The classes may be made up of foremen from a single plant or of foremen in the same industry from different plants.

Industrial Teacher Training courses are offered through extension classes, and by correspondence study.

## INDUSTRIAL TEACHER TRAINING

In co-operation with the State Board for Vocational Education this department conducts training courses which are preparatory to teaching trade and industrial subjects.

This work is given through extension classes in cities where there is a sufficient number of men interested in teaching trade and industrial

subjects to make such class work a success. For those who are so situated as to have no opportunity for class instruction, certain of these courses are offered by correspondence study.

The following studies may be taken in extension classes or by correspondence study for college credit by those who have had the required preparation for admission to the college.

Voc.Ed. 317—Social Significance of Industrial Education	3 credits
Voc.Ed. 318—Trade Analysis . . . . .	3 credits
Voc.Ed. 408—Foundations of Industrial Education . . .	3 credits
The following are offered only in extension classes.	
Phys.Ed. 106—First Aid and Safety . . . . .	2 credits
Phys.Ed. 107—Advanced First Aid and Safety . . . .	2 credits
Phys.Ed. 108—Teacher Training in First Aid and Safety .	2 credits

The following courses are offered for graduate credit, in extension classes only, to those who meet the requirements for admission to the Graduate College.

Voc.Ed. 510—Technique of Teaching Trades . . . . .	3 credits
Voc.Ed. 518—Problems in Industrial Education . . . .	3 credits
Voc.Ed. 524—Industrial Conference Methods . . . . .	3 credits
Voc.Ed. 525—Problems in Part Time Education . . . .	3 credits
For full description of studies see the respective departments.	

## VISUAL INSTRUCTION SERVICE

The Visual Instruction service is conducted jointly by Engineering Extension and Agricultural Extension, for the purpose of disseminating information by means of motion pictures, lantern slides, charts, and other visual aids. This material is supplied to civic and commercial clubs, churches, schools, community centers, farm bureaus, and similar organizations.

There are available for distribution 1,200 reels of motion picture film pertaining to agriculture, engineering, trades and industries, home economics, and allied subjects. The slide library contains 250 sets of lantern slides (many of them colored) with accompanying lecture notes which may be read or serve as a guide for the lecturer.

In addition to loaning films, slides, and charts, advice and assistance are given in matters pertaining to projectors and projection.

## RADIO BROADCASTING

Station WOI is maintained for the purpose of making available to the people of the state those services of the College which are made most effective by means of radio-broadcasting. Accordingly the programs consist of educational material, such as lectures and short courses; information, such as weather reports, news, crop and market reports; and inspirational and entertainment features, including chapel services, addresses by distinguished visitors, athletic contests, dramatic productions, musical programs, etc.

The programs are prepared under the joint direction of Engineering Extension and Agricultural and Home Economics Extension.

## TECHNICAL INFORMATION

Technical Information is made available to the various interests of Iowa through the collection of information, investigation, conferences, lectures, exhibits, bulletins, and answers to inquiries.

Technical information and preliminary engineering advice of a general nature are furnished municipalities, commercial and civic organizations on matters of municipal improvements. A similar service is furnished the industrial interests of the state, and investigations of problems of particular interest to individuals are being made constantly.

It is not the purpose of this department to invade the field of the consulting engineer.

## LOAN MATERIAL

To make technical information available for individual study and research this department selects and loans printed matter on engineering and industrial subjects on request. These selections may include books, pamphlets, clippings, blueprint plans, and photographs, the contents in each case being so selected as to best answer the individual requirements of the borrower.

## LECTURES

In connection with the Technical Information service, lectures are offered to groups of people on the following subjects: City Planning, Refuse Disposal, Sewage Disposal, Water Supply, Electric Lighting, Street Improvement, Traffic Regulation, Industrial Safety, Smoke and Smoke Prevention, Fuel Conservation, Boiler-room Economy, Rural Electric Service, and Ceramics.

Specialists are available for lectures on other subjects not mentioned above.

These lectures, while on technical subjects, are of such a popular nature that they are readily understood by anyone.

## BULLETINS

In order to present technical information of value to those who are not engineers, there are issued from time to time bulletins of special interest to Iowa municipalities, industries, trades, and individuals. These bulletins are the result of investigations, tests, lectures, or papers given during conventions or short courses, or valuable information from other sources. A complete list of bulletins available for distribution will be mailed free on request.

Full particulars concerning any of the work mentioned above will be given on application to the Engineering Extension Service, Iowa State College, Ames, Iowa.

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# The College

The Iowa State College of Agriculture and Mechanic Arts conducts work in five major fields:

AGRICULTURE  
ENGINEERING  
HOME ECONOMICS  
INDUSTRIAL SCIENCE  
VETERINARY MEDICINE

The Graduate College conducts research and instruction in all these five fields.

Four-year and five-year collegiate curricula are offered in different divisions of the College. Non-collegiate curricula are offered in agriculture. Summer sessions include graduate and collegiate work. Short courses are offered in the winter.

Extension courses are conducted at various points throughout the state.

Four special research institutes have been organized: the Agricultural and Engineering Experiment Stations, and the Veterinary and Industrial Science Research Laboratories.

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